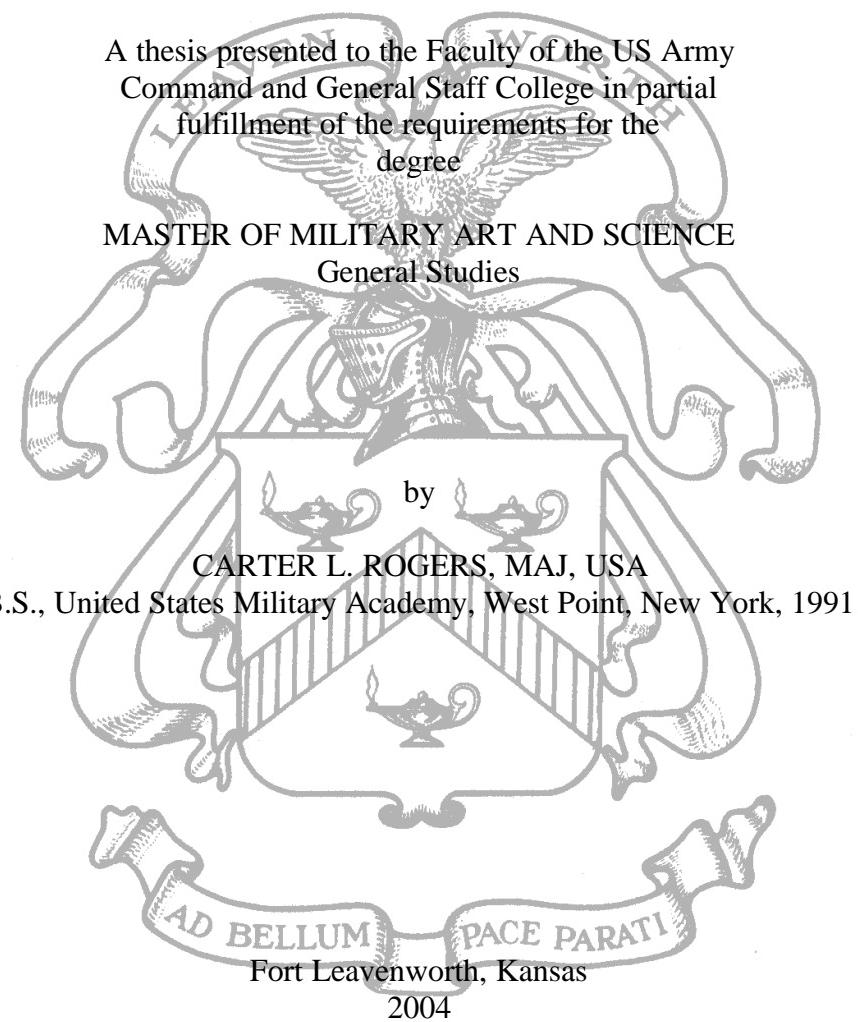


ARMY TACTICAL MISSILE SYSTEM:
REVOLUTIONARY IMPACT ON DEEP OPERATIONS



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MASTER OF MILITARY ART AND SCIENCE

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the US Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

ARMY TACTICAL MISSILE SYSTEM: REVOLUTIONARY IMPACT ON DEEP OPERATIONS, by Major Carter L. Rogers, USA, 66 pages.

This thesis provides an analysis of the revolutionary impact the Army Tactical Missile System (ATACMS) had on developing joint doctrine for deep operations. ATACMS provides US joint force with the ability to execute deep strike missions against enemy forces with precision and responsiveness. The Army fielded the missile system during Operation Desert Storm where it performed brilliantly against enemy air defense, surface-to-surface missiles, and logistics sites. The successful employment of ATACMS during the Gulf War substantiated its role on the joint battlefield and aided in the generation of new joint doctrine and tactics, techniques, and procedures to ensure its proper employment in deep operations. US joint forces utilized the newly implemented joint doctrine to fight Operation Iraqi Freedom. Its integration in supporting joint forces Land component command and corps deep operations clearly demonstrated its impact on striking the enemy deep with unprecedented results. ATACMS provides the joint force an all-weather means to attack targets with short notice out to ranges of 300 kilometers.

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ACRONYMS

AAR	After Action Review
AFOM	Army Tactical Missile System, Family of Munitions
APAM	Anti-Personnel Anti-Material
ARCENT	Army Central Command
ATACMS	Army Tactical Missile System
ATO	Air Tasking Order
BAT	Brilliant Anti-Armor Technology
BCD	Battlefield Coordination Detachment
C2	Command and Control
CALL	Center for Army Lessons Learned
EW	Electronic Warfare
FECC	Fire and Effects Coordination Cell
FSCL	Fire Support Coordination Line
GPS	Global Positioning System
HIMARS	High Mobility Artillery Rocket System
HPT	High Payoff Target
HVT	High Value Target
I MEF	First Marine Expeditionary Force
JFACC	Joint Force Air Component Command
JFC	Joint Force Commander
JFLCC	Joint Force Land Component Command
JSEAD	Joint Suppression of Enemy Air Defense
JSTARS	Joint Surveillance Target Attack Radar System

JTACMS	Joint Tactical Missile System
JTTP	Joint Tactics, Techniques, and Procedures
MEA	Munition Effectiveness Assessment
MLRS	Multiple Launch Rocket System
MRL	Multiple Rocket Launcher
NATO	North Atlantic Treaty Organization
OIF	Operation Iraqi Freedom
ODS	Operation Desert Storm
P3I	Pre-planned Product Improved
PAH	Platoon Air Hazard
ROZ	Restricted Operating Zone
SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defense
SOF	Special Operation Forces
SOP	Standing Operating Procedure
SPLL	Self-Propelled Loader Launcher
SSM	Surface-to-Surface Missile
TACMS	Tactical Missile System
TAH	Target Air Hazard
TCT	Time-Critical Target
TLE	Target Location Error
TOT	Time-on-Target
TRADOC	Training and Doctrine Command
TST	Time Sensitive Target
TPP	Tactics, Techniques, and Procedures

UAV	Unmanned Aerial Vehicle
USAFE	United States Air Forces in Europe
USAREUR	United States Army, Europe
USCENTCOM	United States Central Command
USJFC	United States Joint Forces Command
VCA	V Corps Artillery

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CHAPTER 1

INTRODUCTION

Background during Development

The Army Tactical Missile System (ATACMS) provides US armed forces with a long-range, surface-to-surface missile designed to attack high payoff targets (HPT) beyond the range of conventional artillery and rockets.

ATACMS was the successor to the Lance missile system. Lance fired a tactical missile that could carry either a nuclear warhead out to 120 kilometer or high-explosive warhead out to 75 kilometers. Its primary role was to support the Cold War mission of delivering a thirty-kiloton nuclear warhead to counter the Warsaw Pact threat in Europe (Global Security 2002, 1). Its capabilities were very limited and the system became obsolete and inefficient during the latter part of the 1970s and 1980s. As a result, the Department of Defense cancelled the project in March 1980. The US Army sought a more capable asset able to perform the same mission but with a requirement for fewer personnel and a more simplified logistics and maintenance support structure (Redstone Arsenal 2003, 2). This improved missile system would support the improved and offensively-oriented AirLand Battle doctrine. The characteristics prescribed in the new doctrine were flexibility, maneuverability, lethality, and responsiveness.

In June 1982, the US Army and US Air Force combined their efforts on separate missile programs in order to initiate the development of the Joint Tactical Missile System (JTACMS) (Redstone Arsenal 2003, 3). The original intention of the project was to give both the Army and Air Force a platform to employ a medium-range and long-range missile harnessing the best technology from both services. In November 1984, the

Deputy Secretary of Defense understood the need to replace Lance and decided that the Army required a joint missile system more urgently than the Air Force. In order to expedite its development and fielding and in order to break the interservice debate concerning project ownership of JTAMCS, the Secretary of Defense approved the Army's request to take responsibility for the project and develop an interim version of JTACMS (Redstone Arsenal 2003, 3). The purpose of JTACMS was to counter Warsaw Pact second echelon forces and give a US Army Corps the ability to range the entire battlefield and outrange enemy artillery (Laughbaum 1999, 10). The Army renamed the system ATACMS (Redstone Arsenal 2003, 3).

Lance battalions continued to operate during the 1980s as ATACMS development was underway. During this same period, the US Army was transforming its doctrine into the new and aggressive AirLand Battle doctrine which culminated in 1982 with the publication of Field Manual 100-5, *Operations*.

AirLand Battle is the structure of modern warfare, the dynamics of combat power, and the application of the classical principles of war to contemporary battlefield requirements. All ground actions above the level of the smallest engagements will be strongly affected by the supporting air operations of one or both combatants. (1982, 9)

FM 100-5 placed emphasis on the battle leader to act independently as the situation changed or developed based on his higher commander's intent (Laughbaum 1999, 8-9). AirLand Battle also progressed in that it introduced the operational level of warfare to Army doctrine. This enabled the ground force to focus on winning the first battle by defeating the enemy in a specific place and time through synchronized battles in order to achieve common objectives (Laughbaum 1999, 9). The Training and Doctrine Command (TRADOC) Commander, General Starry, stated in the early 1980s that,

Breaking up the mass and slowing the momentum of second echelon forces is critical to the ground commander fighting the first echelon. The air commander hasn't the organic resources either to find or to fire at the second echelon. Forces fighting the first echelon must have the additional target servicing of aerial firepower to win against a breakthrough. (Romjue n.d., 6)

This statement shows how important it was for the Army to develop a weapon system that could affect the battle initially by attacking HPTs located at the enemy's second echelon in the deep area. AirLand Battle doctrine created the deep battlefield framework, and at the time of its inception, the US Air Force controlled the deep battlefield. US forces would have the ability to more violently affect the enemy's second echelon by attacking deep with land and air assets creating a decisive advantage for ground forces in contact with enemy first echelon forces. ATACMS would give the ground commander that capability to strike deep and set the conditions for his maneuver forces to fight the enemy's first echelon.

The key to winning the AirLand Battle in Europe was not to engage in a long war of attrition, but rather to attack the Soviet formations precisely with violence and in depth in order to set the conditions for victory. Attacking in depth would apply the principles of initiative, mass, economy of force, and surprise and would disrupt the Soviet's command and control and logistics operations. This disruption would cause his frontline formations to lose critical logistics functions, coordinated commands, and key intelligence information. This would directly effect the performance and readiness of frontline formations and give American forces a distinct advantage.

This logic set the stage for the US Army's development of two deep fire assets: ATACMS and the Apache attack helicopter. It is important to define deep operations and to explain where they apply to the enemy on the battlefield. A division is the lowest

echelon that has assets that can affect the deep fight. Deep operations are typically fought at Corps level and above. Field Manual 100-15, *Corps Operations*, defines deep operations as

operations directed against enemy forces and functions beyond the close battle. They may be separated from the close battle in time or space or both. The commander can execute deep operations by combining maneuver, fire support, and/or electronic warfare (EW) supported by intelligence. By design, deep operations dominate the enemy by: nullifying his firepower; disrupting his command and control (C2) and operational tempo; destroying his forces; preventing reinforcements; destroying his installations and supplies; and breaking his morale. (1996b, 2-2)

System Overview

Although US forces never had to employ ATACMS against an attacking Soviet Army, the system proved very effective during Operation Desert Storm (ODS). After nine years of research and development throughout the 1980s and after accelerated testing, the Army fielded the ATACMS in 1990 for use during ODS (Redstone Arsenal 2003, 4.) Alpha Battery, 6-27th Field Artillery Battalion, fired the first ATACMS Block I missile in support of a suppression of enemy air defense (SEAD) mission against an SA-2 site and successfully neutralized the target (Redstone Arsenal 2003, 5). Though its doctrine was relatively new and untested, the system proved accurate and lethal with unprecedented results.

Before the development of ATACMS, the Army typically used rockets or conventional tube artillery to conduct SEAD, but due to range limitations on both systems, they were unable to fire SEAD in support of deep operations. With the use of Block I ATACMS, the range for SEAD fires increased from 30 to 165 kilometers.

The process of planning and delivering joint fires in support of deep operations is very complex and starts with targeting and evolves through airspace coordination and

deconfliction. ATACMS is a combat multiplier in the deep battlespace because it can neutralize or suppress a large array of target types to include: air defense and surface-to-surface (SSM) radars or missiles, logistics nodes, tactical and aviation assembly areas, command and control centers, and lightly armored equipment. In the joint fight, commanders can utilize ATACMS to suppress or neutralize enemy SSM or air defense radar and missile sites in support of joint, deep operations. This is known as Joint SEAD (JSEAD) and greatly increases the survivability of the attack helicopters and Air Force aircraft conducting the strike. Executing JSEAD with ATACMS in support of a deep operation gives aviators security and flexibility. Before ATACMS, Army and Air Force aircraft had to conduct their own SEAD in order to increase their survivability. The Army also had MLRS and conventional artillery to conduct SEAD, but at limited ranges out to thirty kilometers. Using ATACMS as a JSEAD munition relieved aviation assets of that mission, giving them more flexibility to conduct a deep operation against high payoff targets or an armored force.

The Army fielded ATACMS during ODS in order to conduct deep strike missions against targets well behind enemy front lines (Teal Group Corporation 2003, 6). The original intent for ATACMS was to provide the Army and Air Force with a joint missile that could attack the enemy's second and third echelon forces (Teal Group Corporation 2003, 6). ATACMS Block I missile fulfilled this function during ODS as a SEAD munition by providing the air component with secure ingress and egress routes to the deep target area. This forced the US Army to become more involved in planning and executing of SEAD fires which required more emphasis on the joint interoperability of ATACMS.

The concept of joint operations has become US armed forces' primary method for fighting today's wars. ATACMS is the critical fire support asset in the joint targeting process because of its range, accuracy, responsiveness, and all-weather capability. The two major advantages ATACMS has over other deep operating systems are its responsiveness and all-weather capability. Aviation assets of all types have weather, personnel, and maintenance limitations that can restrict their ability to get into the fight quickly. Chapter 4 will detail a comparison and contrast of several deep attack systems and evaluate their lethality, flexibility, responsiveness, and all-weather capabilities.

ATACMS is structured to play a primary role in deep operations for the future force in Joint Vision 2020. The joint force land component command (JFLCC) now has an asset that can shape the battlefield and provide fires out to 300 kilometers. This capability is accurate, responsive, and all weather. The vision for Joint Force 2020 attempts to synergize the joint fight by utilizing assets from all services simultaneously to maximize effects. ATACMS is the ideal Army asset to support that vision with its responsiveness, lethality, and ability to strike a varying array of high payoff targets out to 300 kilometers. The newly developed high mobility artillery rocket system (HIMARS), discussed later, fires all munition variants of ATACMS and is C130 aircraft deployable. HIMARS fits the rapid deployment and joint-capable requirements of Joint Force 2020.

Research Question

Did the Army Tactical Missile System have revolutionary impact as the deep fires system that enabled the AirLand Battle doctrine to evolve into a more lethal and joint, deep operations doctrine?

Revolutionary change in warfare is defined as “an action which undermines the structure of existing knowledge and necessitates the building of a new conceptual framework” (Baumann 2003, E-496). The impact must demonstrate unprecedented performance and doctrinal transformation in order to be considered revolutionary. The initial secondary question one must consider is: Did a comparable capability exist prior to fielding ATACMS? Lance missile system did provide a midrange nuclear and conventional capability that supported AirLand Battle doctrine. However, were the capabilities of the Lance missile system dynamic enough to truly involve the Army in joint and deep operations in conjunction with the Air Force? ATACMS represented a substantial improvement in responsiveness, firepower, range, and accuracy over Lance; this improvement will set the foundation for answering the research question.

Determining how effective ATACMS was in a combat environment and if it served its original purpose are key pieces of information required to develop the next secondary research question: Did the implementation and performance of ATACMS during ODS define its role in deep operations doctrine? ATACMS exceeded expectations in ODS, but was its impact on deep operations the catalyst that led to certain doctrinal shifts in the 1990s? The evidence must link its performance and success to those doctrinal shifts, and once that relationship is established, one will be able to determine if ATACMS was the deep fires system that enabled US armed forces to be successful in joint, deep operations during Operation Iraqi Freedom (OIF).

The creation of new procedures to plan and execute ATACMS fires directly impacted on the development of joint doctrine during the interwar period between ODS

and OIF. Did its combat fielding and execution during ODS provide a catalyst to further develop joint doctrine as it relates to targeting and deep operations?

The best means to answer this question is to analyze the Joint Publications, ATACMS tactics, techniques, and procedures (TTPs), targeting TTPs, and joint handbooks that US Joint Forces Command (USJFC) developed to better execute joint, deep operations. There was a doctrinal shift that occurred during the interwar period that had a significant impact on deep operations doctrine. Professional research and journals will also address this doctrinal shift and relate the performance of ATACMS to the newly developed joint doctrine for deep operations.

The next secondary question will compare and contrast deep attack systems' ability to successfully attack time sensitive targets (TST). This question will allow delineation and distinction of ATACMS from other joint assets. What deep attack system is best suited to attack the commander's TSTs?

Once the thesis establishes the impact of ATACMS on joint doctrine for targeting and deep operations, an analysis of the joint doctrine in action during OIF will follow and answer the next secondary question: Did the successful employment of ATACMS during OIF validate the joint doctrine for deep operations that was developed during the interwar period?

It is important to explore what purpose ATACMS will have in the future force doctrine and determine if the system will maintain its role as a vital deep fires asset. ATACMS currently provides precisely the right capability of accuracy, responsiveness, and all-weather employment. If these capabilities and doctrinal impact prove to be

revolutionary today, will that capability fit into Joint Force 2020 as a means to synergize the joint fight?

Definition of Terms

ATACMS is a precious asset that is in limited supply on the battlefield. Commanders cannot afford to attack every important target in the deep battlespace with ATACMS. They must develop a prioritized list of enemy targets that, if engaged successfully, would improve the friendly tactical situation on the battlefield to achieve victory. This type of target is called a high-payoff target (HPT) and is specifically defined as “a target whose loss to the enemy will significantly contribute to the success of the friendly commander’s mission” (JP 3-60 2002, GL-6).

Understanding what a fire support coordination measure (FSCM) is will assist in explaining the significance of the fire support coordination line (FSCL). The definition of an FSCM is “a measure employed by land or amphibious commanders to facilitate the rapid engagement of targets and simultaneously provide safeguards for friendly forces” (JP 3-0 2001, GL-9).

The basic AirLand Battle doctrine gave the ground force commander control of the close fight with his assets and capabilities, while the Air Force would engage targets deep. The method used to separate the Army’s and Air Force’s areas of responsibility for engaging targets was called the FSCL. Even though Army attack aviation had characteristics that could have supported the deep fight, their mission in AirLand Battle doctrine was to support the ground maneuver force. Attack aviation could accomplish the following tasks: provide overwatch with antitank fires, attack enemy flanks and rear,

conduct counterattack and raids, dominate key terrain, and engage enemy helicopters (FM 100-5 1986, 43).

The FSCL is a permissive FSCM that aids in preventing fratricide and is a tool to facilitate the targeting process. Its definition is as follows:

A fire support coordinating measure that is established and adjusted by appropriate land or amphibious force commanders within their boundaries in consultation with superior, subordinate, supporting, and affected commanders. Fire support coordination lines (FSCLs) facilitate the expeditious attack of surface targets of opportunity beyond the coordinating measure. An FSCL does not divide an area of operations by defining a boundary between close and deep operations or a zone for close air support. The FSCL applies to all fires of air, land, and sea-based weapons systems using any type of ammunition. Forces attacking targets beyond an FSCL must inform all affected commanders in sufficient time to allow necessary reaction to avoid fratricide. Supporting elements attacking targets beyond the FSCL must ensure that the attack will not produce adverse attacks on, or to the rear of, the line. Short of an FSCL, all air-to-ground and surface-to-surface attack operations are controlled by the appropriate land or amphibious force commander. The FSCL should follow well-defined terrain features. Coordination of attacks beyond the FSCL is especially critical to commanders of air, land, and special operations forces. In exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL. However, failure to do so may increase the risk of fratricide and could waste limited resources. (JP 1-02 2003, 199)

Under AirLand Battle doctrine both Army and Air Force assets primarily engaged their own targets and coordinated fires on their respective sides of the FSCL. Each component had independent command and control systems and less frequently had to coordinate and deconflict fires.

Deep operations doctrine did exist for the division and corps commanders within the construct of AirLand Battle doctrine. The strike assets for the deep attack were Army aviation, artillery, rocket, and missile systems (FM 100-5 1986, 38). At that time, however, attack aviation and artillery and missile fires could strike deep, and still fall short of the FSCL. FM 6-20-30, *Tactics, Techniques, and Procedures for Fire Support*

for Corps and Division Operations, dated October 1989, listed as the primary deep SEAD assets as field artillery, long-range rockets (MLRS), and surface-to-surface missiles (Lance). The field manual caveats Lance's effectiveness in deep fires with the following note, "The conventional Lance warhead has a limited capability for SEAD. Near-term developments in MLRS range capabilities will improve the Army SEAD capability" (FM 6-20-30 1989, App. B). FM 6-20-30 frequently refers to ATACMS as a "primary tool used to provide long-range deep attack fires" (1989, App. B). One can conclude that this near-term range improvement referred to ATACMS, the system that the Army was developing to exceed Lance's range and responsiveness.

Though not yet fielded, FM 6-20-30 does address ATACMS as an attack asset for deep operations. The doctrine did consider its contribution as a deep asset without giving detailed planning factors or coordination procedures for firing well beyond the FSCL.

With the introduction of ATACMS, the ground commanders at corps and JFLCC levels possessed an organic munition that could range beyond the FSCL. The staffs at these levels were required to integrate ATACMS as a deep strike asset into the targeting cycle. This integration brought into question which TTPs the joint services were going to use to ensure the FSCL's proper placement would facilitate effective planning and coordination of deep operations.

Certain coordination and planning TTPs changed for deep operations at the corps level and above. These changes are evident in Army and joint TTPs published during the interwar period of 1991 to 2002. Joint doctrine refined the targeting and specifically included ATACMS as an integrated component of the targeting process (JP 3-60 2002, C-10). Using the new TTPs and joint doctrine to integrate ATACMS into deep

operations, corps and JFLCC commanders control a lethal weapon system that provides them operational and tactical flexibility and firepower.

ATACMS is an Army asset that fires SEAD and deep attack missions in conjunction with Air Force or maritime air assets. This joint role requires close airspace coordination both to prevent fratricide and to synchronize the effects of deep fires. Listed below are a few applicable terms used in airspace coordination. The airspace control order (ACO) is defined as “an order implementing the airspace control plan that provides the details of the approved requests for airspace control measures. It is published either as part of the air tasking order or as a separate document” (JP 1-02 2003, 26).

“Preplanned Army attack aviation, unmanned aerial vehicle (UAV) flights, Army Tactical Missile System firings, and airborne intelligence collectors appear in the ACO which is transmitted along with the air tasking order (ATO), . . . but it is a separate order” (FM 34-25-1 1995, 3-6). The ATO is defined as follows:

Method used to task and disseminate to components, subordinate units, and command and control agencies projected sorties, capabilities, and/or forces to targets and specific missions. Normally provides specific instructions to include call signs, targets, controlling agencies, etc., as well as general instructions. (JP 1-02 2003, 29)

The air operations center issues the ATO in sufficient time for the aircrew and supporting elements to plan their missions; the order covers a specific period, normally twenty-four hours (FM 34-25-1 1995, 3-6). The ACO is a tool the services use to deconflict airspace through automated command and control links. This concept is called joint airspace control in the combat zone. It is defined as:

Process used to increase combat effectiveness by promoting the safe, efficient, and flexible use of airspace. Airspace control is provided in order to prevent fratricide, enhance air defense operations, and permit greater flexibility of operations. Airspace control does not infringe on the authority vested in

commanders to approve, disapprove, or deny combat operations. Also called combat airspace control; airspace control. (JP 1-02 2003, 26)

Attacking time sensitive targets (TST) is a primary mission for ATACMS. JP 3-6, *Joint Doctrine for Targeting*, defines a TST as “a target of such high priority to friendly forces that the joint force commander (JFC) designates it as requiring immediate response because it poses or will soon pose a danger to friendly forces, or it is a highly lucrative, fleeting target of opportunity” (JP 3-60 2002, vii).

Limitations and Delimitations

This thesis will not attempt to solve that ongoing FSCL controversy between the US Army and US Air Force. Discussion of the FSCL will provide evidence in demonstrating the impact of ATACMS on deep operations.

Accounts of recorded data from US combat operations in ODS and OIF are accurate and sufficient to use as evidence in supporting this thesis. The thesis research will be limited to unclassified documents.

Though tested successfully at White Sands Missile Range, the thesis will limit discussion of ATACMS anti-armor Block II capability to future force contribution.

The AH-64 Apache Attack Helicopter arguably had revolutionary impact on deep operations. The thesis will not discuss in depth the effect Apache's capabilities had on influencing joint doctrine. The thesis will, however, compare the two systems' ability to service TSTs and function under extreme conditions.

For the purpose of simplicity, all references to the Land Component Command will be considered a joint forces land component command (JFLCC). In certain operations there is a combined aspect to the JFLCC, but the combined functionality does

not contribute to the thesis and is therefore unnecessary to address. In all cases argued in this thesis the land component was joint in nature.

System Capabilities

The platform used to fire the ATACMS missile is the multiple launch rocket system (MLRS). The M270 self-propelled loader launcher (SPLL or launcher for short) is a tracked vehicle able to maneuver through the same conditions as an M2 Bradley fighting vehicle. The launcher's mobility increases its survivability on the battlefield and allows it to reload missile pods in a rapid manner. The M270 has a maximum speed of 65 kilometers per hour and a range of 479 kilometers allowing it to maintain the operational tempo of the Army's armored assets (US Congress 1992, 835).

An MLRS battalion has eighteen launchers, each capable of firing twelve MLRS rockets or two ATACMS missiles before having to reload. A launcher can fire two missiles at two different aim points within twenty seconds (FM 6-60 1996a, I-1). Reloading takes approximately five-to-ten minutes for twelve rockets or two missiles. This time can vary, however, based on the terrain, proximity to the rearm point, enemy counterfire threat, and crew proficiency. Each launcher has its own fire control system and can operate independently on the battlefield. The smallest tactical element in an MLRS battalion is the platoon consisting of three launchers. An MLRS platoon normally requires a three-by-three kilometer oval as its operational area, but can vary based on the enemy situation, terrain, time available, and risk assessment (FM 6-60 1996a, III-1). The platoon operational area is considerably large and contains multiple firing points for each launcher improving survivability. Each firing platoon will have at least two reload points,

three hide areas (one per M270), and nine firing points (three per M270) in order to maximize responsiveness and survivability (FM 6-60 1996a, III-1-2).

ATACMS currently has four different missile types in its family of munitions. ATACMS Block I missile is inertial-guided and delivers 950 antipersonnel antimaterial (APAM) submunitions over a stationary target in order to destroy, neutralize, or suppress it. The range of an ATACMS Block I missile is from 25 to 165 kilometers; the Block IA missile delivers 350 APAM submunitions and has a minimum range of 70 kilometers and an increased maximum range of 300 kilometers (ST 6-60-30 1999, 2). Its inertial guidance system receives positional corrections in flight from global positioning system (GPS) to improve accuracy at a greater range. The Block I and Block 1A missiles have approximately the same time of flight at their maximum ranges (ST 6-60-30 1999, 35).

The M270A1 SPLL has special software that is GPS integrated and is the only armored platform that can fire the Block IA missile. ATACMS functions under any weather or visibility conditions. This all-weather capability gives the M270 and M270A1 firing the ATACMS missile a distinct advantage over attack helicopters, rockets, and conventional artillery whose operations are limited under extreme weather conditions. Conventional artillery and rockets require meteorological data in order to accurately engage their targets (FM 6-60 1996a, 4-I). Not requiring these meteorological data increases the responsiveness of ATACMS and simplifies fire coordination.

A commander can order the firing of both Blocks I and IA at any type of target for suppression; but ATACMS is most effective against soft and stationary targets. Examples of soft targets are: assembly areas, logistical nodes, command and control

nodes, surface-to-air missile sites, surface-to-surface missile sites, air defense missile sites, radar systems, and light-skinned vehicles (ST 6-60-30 1999, I-2).

The Block II missile contains brilliant anti-armor technology (BAT) submunitions that can neutralize a formation of armored vehicles at ranges out to 145 kilometers. The BAT submunitions within each missile can select particular armored targets from a field of numerous vehicles (Vanbebber 2002, 1).

The improved BAT submunition called preplanned product improved (P3I) will give the Block II additional capability and lethality of striking cold, stationary targets. Cold targets do not emit any type of signal or heat because their engines are disengaged (Hillard 1996, 22).

The newest missile to hit the production line for the US Army is the ATACMS Block IA Unitary. This missile has the same characteristics as the Block IA missile, with the exception of its munitions payload. The unitary missile carries a 500-pound warhead and detonates on impact (Vanbebber 2002, 1). The ATACMS Block IA Unitary missile focuses its destructive power into a small area in order to minimize collateral damage (Vanbebber 2002, 1).

The newly fielded wheeled platform called the high mobility artillery rocket system (HIMARS) can also fire the ATACMS missile. HIMARS can fire one ATACMS missile or six MLRS rockets and has the required stability and navigation systems to fire the entire family of MLRS rockets and ATACMS missiles (Baker 2003a, 3). The new system is considerably lighter and can be transported into the theater of operations on a C-130 Hercules aircraft (Baker 2003b, 22). HIMARS is a good fit for the US Army's future force.

CHAPTER 2

LITERATURE REVIEW

Overview

The purpose of this literature review is to present clear and logical evidence designed to build the foundation for proving the revolutionary impact of ATACMS deep operations. Numerous sources and publications support the argument that ATACMS functioned as an Army asset in support of joint operations with revolutionary impact on deep operations during ODS and OIF. This literature review starts with a discussion of AirLand Battle doctrine described in FM 100-5, *Operations*, in order to establish a foundation for the development of ATACMS.

The review will flow through three principal periods; each time period will correlate to the appropriate secondary research questions outlined in chapter 1. The three principal periods are as follows: pre-gulf war and Operation Desert Storm; interwar period 1991 to 2002; and Operation Iraqi Freedom and beyond.

Pre-Gulf War and Operation Desert Storm

During the mid-1980s the Army shifted to more aggressive and offensive-focused doctrine designed to neutralize Warsaw Pact forces in Europe through close and deep operations. FM 100-5, *Operations*, introduced the AirLand Battle concept giving North Atlantic Treaty Organization (NATO) forces in Europe a tool to assume and maintain the initiative against enemy forces. FM 100-5 states that successful deep operations will “limit the enemy’s freedom of action, alter the tempo of operations in favor of the friendly force, and isolate the close fight on advantageous terms” (1986, 37). FM 100-5 also begins to link field artillery assets to supporting joint operations by defining

suppression of enemy air defense as “fires in conjunction with attack helicopter, close air support, or joint air attack team operations” (1986, 44). The Army developed field artillery doctrine to support AirLand Battle doctrine with a heavy focus on joint attack of the second echelon, joint suppression of enemy air defense (JSEAD), and deep operations (FM 6-20 1988, 1). This joint scope for field artillery cannon, rocket, and missile fires provided the Army with a doctrinal foundation from which to fight Operation Desert Storm.

As a result of the doctrinal shift from *Field Artillery Tactics and Techniques to Fire Support for Combined Arms Operations*, the US Army published FM 6-20, *Fire Support in the AirLand Battle*, in May 1988 (FM 6-20 1988, 1). The primary functional areas of fire support covered in FM 6-20 are conventional, nuclear, and chemical fires; tactical air operations; and JSEAD (FM 6-20 1988, 1). The delivery of deep attack fires is the most responsive means the operational commander has to disrupt enemy threat operations and has the following assets to execute deep operations: rocket and missile fires, tactical air, or naval gunfire (FM 6-20 1988, 3-1).

There is specific reference to having the land component provide fires in the form of SEAD in order to facilitate the air component’s ability to conduct deep operations (FM 6-20 1988, 3-10). FM 6-20 also outlines general planning considerations and basic deep attack target development that take into account the process of decide, detect, and deliver. Decide is the commander’s targeting guidance on high payoff targets (HPTs); detect is the means and assets used to acquire those targets; and deliver is selection of the appropriate system and actual delivery of munitions to achieve the desired effects.

FM 6-20-30, Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations, published in October 1989 expanded the doctrinal foundation for fire support in the AirLand Battle. The US Army developed these TTPs during the latter part of the cold war in order to properly execute fire support plans that support deep operations in the context of AirLand Battle doctrine. These TTPs provided the doctrinal foundation for US fire support forces during ODS. FM 6-20-30 specifically addressed providing SEAD fires in the form of Army rockets and missiles in support of deep operations; this doctrine was in place when the Army fielded ATACMS.

Staffs and commanders involved in combat during Operation Desert Storm generated numerous after action reviews (AAR), personal accounts of ATACMS fire missions, and performance statistics. The AAR of VII Corps Artillery gives a detailed breakdown of each of the twenty-four ATACMS fire missions. The opening line refers to ATACMS as a “great system, good range, responsive, flexible missiles” (US Army VII Corps n.d., 5). The VII Corps fired a total of thirty-two Block I missiles at a wide array of target types. Ten of the missions were SEAD targets with six of the targets being destroyed, and the other four were apparently neutralized, based on evidence that the radar emission signatures ceased after the attacks (US Congress 1992, 835). Other target sets attacked were logistics refueling sites, multiple rocket launchers (MRL), Frog SSM sites, and a bridge (US Army VII Corps n.d., 7). Executing command and control was relatively uncomplicated, and in each case, the Corps Commander had release authority. VII Corps generally used ATACMS to strike corps HPTs.

VII Corps Artillery stated in their AAR that the current AirLand Battle fire support doctrine they utilized during ODS was sufficient to fight the enemy in depth and

allowed them to synchronize close and deep targeting with the maneuver plan (US Army VII Corps n.d., 13). Command and control of ATACMS was a new concept during ODS, and often required wait times in excess of two hours for airspace clearance. But with the assistance of the aerial command and control platform joint surveillance target attack radar system (JSTARS), airspace clearance became more efficient and routine (US Army VII Corps n.d., 15).

The *Final Report to Congress: Conduct of the Persian Gulf War* details several ATACMS fire missions and effects. The report addresses the mission, accomplishments, shortcomings, employment, and specifications of ATACMS while in a combat role (US Congress 1992, 834-836). This unbiased document will assist in proving or disproving the primary research question and will aid in answering the secondary questions pertaining to ODS.

Interwar Period, 1991 to 2002

It is necessary to explore the joint fire support and targeting doctrine US armed forces developed after the conclusion of ODS in order to determine the impact of ATACMS on joint, deep operations. The specific doctrinal concepts that evolved after the fielding of ATACMS will demonstrate and determine whether or not the system's impact was revolutionary. There are several TTPs for conducting ATACMS fires and joint targeting. These TTPs assist corps and JFLCC targeting groups in successfully integrating ATACMS into joint, deep operations. There are also TTPs used at the MLRS battery that, in conjunction with airspace coordination and targeting, put the effects of ATACMS at the right spot on the battlefield in a timely manner.

Joint Publication 3-60, *Joint Doctrine for Targeting*, gives much more detail when dealing with the fundamental principles of targeting, the joint targeting process, and TST considerations (2002a, v). JP 3-60 provides key procedures for targeting that were not fully developed in AirLand Battle doctrine. JP 3-60 focuses much of its airspace coordination section on examining the procedures to clear airspace for the engagement of targets with ATACMS in support of the JFC.

JP 3-60 considered assets from all services to conduct deep fires by analyzing the applicability and importance attacking TSTs. There was no formal doctrine during ODS to engage TSTs at the joint level; AirLand Battle doctrine for Fire Support categorized TSTs as high-payoff targets of opportunity with no assigned special priority based on their time sensitivity.

Platoons firing ATACMS will have pre-coordinated restricted operating zones (ROZ) called platoon air hazards (PAH) that extend vertically and horizontally from the launchers (ST 6-60-30 1999, 20). These ROZs are placed on the ACO in order to inform the air component and individual aircraft operating in the vicinity of the potential danger area during fire missions. This procedure simplified the process for engaging TSTs and allowed for maximum responsiveness without in-depth coordination for every mission. The Joint Force Air Component Command (JFACC) issues a net call to clear the airspace, so MLRS units can fire ATACMS against the target (JP 3-60 2002, vii).

The *Commander's Handbook for Joint Time Sensitive Targeting* was developed to assist the joint force commander (JFC) and his staff to rapidly and effectively engage TSTs (US Joint Forces Command 2002, i). The publication date for the handbook is 22 March 2002; this was significant in that it gave US Central Command (USCENTCOM)

an additional deep fires planning tool to prosecute OIF. The *Commander's Handbook for Joint Time Sensitive Targeting* is an extension of Joint Publication 3-60 and provides specific procedures for categorizing, processing, attacking, and assessing the effects of attacks on TSTs. It is important to study the procedures for engaging TSTs because they typically line up with the JFC's targeting guidance and require immediate action.

ATACMS is the asset of choice for several target sets and the following quote from the *Commander's Handbook for Joint Time Sensitive Targeting* outlines one key element of USCENTCOM's TST procedure states, "If ATACMS is available, the FSE initiates an "At My Command" mission with the land component and/or initiates an air mission through the BCD. Coordinated ATACMS and air attacks are USCENTCOM's preferred methods of engaging joint TSTs" (US Joint Forces Command 2002, B-2).

The handbook further details procedures to engage a TST in the event ATACMS is not available. The availability of ATACMS is not only based on its capability to engage a particular target. The number of ATACMS missiles that are available on the battlefield at any given time may be very limited, and as a result the JFC or JFLCC commander must specify how he wants his ATACMS assets employed by prioritizing TSTs and HPTs and issuing his specific commander's guidance for deep fires. A subset to the TST is the time-critical target (TCT) which requires immediate engagement or it could pose significant threat to friendly forces (US Joint Forces Command 2002, F-1). An example of a TCT would be a scud missile launcher or radar within range of US forces (US Joint Forces Command 2002, F-2).

The ST 6-60-30, *Army Tactical Missile System, Family of Munitions (AFOM), Tactics, Techniques and Procedures*, lists the capabilities, characteristics, and limitations

of ATACMS. This manual demonstrates that the use of ATACMS is suitable for specific target sets supporting a deep operation. Understanding the system's tactical capabilities and limitations will assist in addressing the issues of land management, airspace coordination, system survivability, munitions characteristics, and tactical employment. Proper planning and employment of ATACMS must consider these components in order to maximize its effectiveness. ST 6-60-30 gives detailed technical data on ROZs and flight specifications. There are also TTPs for planning the employment of each of the ATACMS family of munitions.

Several professional officers from the three armed services have written master theses and monographs discussing the effects and implementation of ATACMS on the battlefield. Authors addressed the issues of airspace coordination, placement of the FSCL, joint targeting, and command and control difficulties giving recommended solutions. Several of the works discuss issues that came about as a result of ODS in an attempt to suggest techniques or solutions to integrate ATACMS into joint doctrine.

The implementation of ATACMS stimulated much discussion about the FSCL during the Interwar Period. The research from these officers considers both the Army and Air Force's role in this dilemma. Their findings provide supporting facts that show how the implementation of ATACMS changed basic AirLand Battle doctrine for deep operations into a more joint-centric doctrine.

MAJ Moskal's monograph discusses the role of ATACMS in JFACC planned deep operations and includes several doctrinal factors that changed as a result of ATACMS implementation. His research directly addresses the Air Force's initial discomfort with the Army's apparent encroachment on their battlespace (Moskal 1995,

1). This discussion is relevant in that it shows that the integration of ATACMS into the joint, deep doctrine was initially recognized as significant. It took detailed restructuring of the FSCL and airspace coordination as well as new JSEAD procedures to get the Army and Air Force synchronized. The conclusions in this monograph assist in proving or disproving that there was a need for the Army and Air Force to revise command and control procedures as a result of implementing ATACMS.

MAJ Hall writes in “Solving Air-Ground Dilemma” how ATACMS planning influenced the implementation and effectiveness of the FSCL (2000, 20-21). He uses examples in ODS to show both sides of the FSCL debate. This thesis assists in describing the procedures for FSCL placement and how it relates to airspace coordination.

MAJ Horner’s thesis titled “Fire Support Coordination Measures by the Numbers” addresses some airspace coordination and clearance problems that arose during ODS. ARCENT missed the opportunity to engage several TSTs due to airspace coordination delays (1999, 23). The thesis does conclude that a JFC should place the FSCL where Army artillery and missiles cease in being the greatest threat to the enemy and where air power can take over the fight (Horner 1999, 65). This is important, because throughout the thesis, MAJ Horner refers to ATACMS as a viable and effective weapon on the battlefield regardless of FSCL placement. He states that the FSCL placement should be contingent on where missiles cease being the greatest threat, but fails to directly link ATACMS to FSCL placement. His conclusions and assumptions link FSCL placement with the planning of ATACMS fires. This link establishes a relationship supporting the impact ATACMS had on deep operations doctrine.

Operation Iraqi Freedom and Beyond

“The Sound of Thunder: V Corps Artillery (VCA) in Operation Iraqi Freedom” gives a detailed account of ATACMS employment during OIF. It is clear from the article that planned ATACMS fires were not too difficult to coordinate, because V Corps had trained countless hours with sister services to deconflict airspace and activate ROZs in a timely and effective manner. VCA fired 414 ATACMS missiles in support of Corps and JFC objectives from A-Day through early April 2003 (Janosko and Cheatham 2003, 35-36). VCA fired the first Block IA rounds at ranges exceeding 250 kilometers and also fired the first ATACMS Unitary round, a missile with a high explosive warhead designed to detonate on impact. The article gives a lot of detail as to the types of missions fired and the way ATACMS supported the overall operational objectives. MLRS units fired at the following wide array of target types: JSEAD targets, operational preplanned targets, close fight targets, time sensitive targets of opportunity, and counterfire targets (Janosko and Cheatham 2003, 35-37).

Analyzing the effects of the 414 ATACMS missiles fired during OIF demonstrates how vital an asset ATACMS was to the coalition’s ability to set the conditions for overwhelming success on the battlefield. One example of its devastation to enemy forces during OIF is stated in the article:

A-day fires shaped Iraq’s 11th Infantry Division by disrupting its command and control and denying it the ability to mass indirect fires above battery level - the MLRS and ATACMS fires’ effectiveness are unquestionable. By the next day, the division had ceased to exist as a coherent fighting force. (Janosko and Cheatham 2003, 35)

In the report titled *Lesson Learned of the Iraq War: Main Report*, Mr. Cordesman and Mr. Burke state that at night during the sandstorms of OIF, ATACMS and MLRS

were continuing to fire (Cordesman and Burke 2003, 262). The 3rd Infantry Division was in an operational pause due to the weather conditions; however, the M270A1 launcher firing ATACMS missiles was still able to perform its mission by attacking deep targets for V Corps and the JFLCC. The V Corps Artillery fired ATACMS when there was no other asset available that could provide joint, responsive fires under those extreme weather conditions. This placed ATACMS in a category of its own for that duration of the battle.

Fred W. Baker III further substantiates the performance ATACMS during the sandstorm of OIF with the following account from his article “Multiple launch rocket system unit provides Operation Iraqi Freedom fires when nothing else can:”

A week into the strike, a dust storm shut down Army and Air Force aviation fires, and the 2d-4th FA became the only all-weather, deep strike capability in the operations area. In the middle of a blinding sandstorm, in two days fifty missiles were fired, allowing the Coalition Forces Land Component Command to maintain its operational tempo in the battle, according to the reports. The unit was so effective that, at one point in the battle, V Corps Chief of Staff Brig. Gen. Daniel Hahn told 214th Field Artillery Brigade Commander Col. Jim Boozer, ‘I cannot send any more fire missions. Due to the effectiveness of your unit’s (2d-4th FA) fires, there are no targets left,’ according to then 2d-4th FA commander Lt. Col. Billy Sprayberry. (2003a, 1)

Baker is referring to fifty ATACMS missiles that the coalition fired in support of the offensive march towards Baghdad. ATACMS missiles fired in conditions that shut down or impaired the operation of other deep strike platforms. Not only did ATACMS missiles attack prioritized targets for the coalition, the missiles provided the required effects that V Corps Artillery desired to meet the commander’s intent.

The JFC allocated MG Petraeus, 101st Airborne Division Commander, several ATACMS missiles to shape his deep fight. Typically a corps would control ATACMS in support of deep operations (USAREUR-USAFFE 2000, 6-5). During OIF, the 101st

Airborne Division (Air Assault) controlled its own ATACMS fires as described in the passage below. The 101st Airborne Division Commander, MG Patreaus, made the following comment in reference to ATACMS fires:

First of all, the ATACMS were tremendous. We did use them very effectively out in the desert, both west of Karbala and northwest of Karbala, packaged with our Apaches for both suppression of enemy air defenses en route to our battle positions and then once our Apaches were in those positions. As I mentioned earlier, those missiles clear a grid square, a square kilometer. And so, those are incredibly lethal and were absolutely devastating against those targets in which we employed them. (Cordesman and Burke 2003, 263)

The 101st Airborne Division coordinated the firing of 114 ATACMS missiles in Iraq achieving the desired effects in order to conduct successful deep operations.

The US Army plans to field a new version of ATACMS in the Block II missile. This fielding would further enhance ATACMS in the future force. The Block II missile contains thirteen brilliant anti-armor technology (BAT) submunitions that can neutralize a formation of armored vehicles at ranges out to 145 kilometers (ST 6-60-30 1999, 5). ST 6-60-30, *The Army Tactical Missile System (Army TACMS), Family of Munitions (AFOM), Tactics, Techniques and Procedures*, covers the TTPs for attacking enemy armored formations with ATACMS Block II.

As described in the article “Lockheed Martin’s ATACMS Block II Missile Performs Perfectly in Test at White Sands Missile Range,” the testing of Block II ATACMS is yielding positive results (Vanbebber 2002, 1). The BAT submunitions within each missile can select particular targets from a field of numerous vehicles. The Lockheed Martin article gives a good account of the results of a test fire using 6-27 Field Artillery (MLRS):

The missile was launched with a test payload of three fully tactical Brilliant Anti-Armor Technology (BAT) submunitions, three flight data recorders and seven

BAT simulants. The cold-conditioned ATACMS Block II missile flew a long-range trajectory and dispensed the payload at the proper location. The government-furnished BATs, produced by Northrop Grumman, destroyed three selected target vehicles in a field of twenty. (Vanbebber 2002, 1)

This type of precision and lethality at a 145-kilometer range will provide a division, corps, or JFLCC commander a means to disrupt an enemy armored formation without initially having to dispatch tanks or Apaches. In conjunction with Block I and Block IA hitting the enemy's soft logistics and command and control targets deep, Block II would be able to destroy the armored targets themselves. This would give US armed forces the capability to engage all types of enemy targets sets found in an armored or mechanized force, and therefore improve the combat ratio giving US armored forces the advantage.

In the *Field Artillery* magazine dated January-February 1996, there is an article titled "ATACMS Block II: Killing Armored Targets Deep" which discusses the command and control, mission sequence, targeting considerations, and logistics involved with deploying the Block II submunition (Hillard 1996, 22-25). Addressing the armor-killing capability of ATACMS in the deep battle will further define its role in deep operations as an Army asset that can augment or substitute for a particular Air Force platform under certain combat conditions.

The improved BAT submunition called pre-planned product improved (P3I) will give the Block II additional capability and lethality in that its target set will expand to include destruction of: cold and stationary targets, surface-to-surface transporters erector launchers, and heavy multiple rocket launchers (Hillard 1996, 22). The Block II missile would give the JFC a responsive asset that could engage more hardened HPTs in support of his deep operations plan or theater missile defense plan (Hillard 1996, 22).

CHAPTER 3

RESEARCH METHODOLOGY

The research methodology model will have an end state of proving or disproving the primary research question. Did ATACMS have revolutionary impact as the fire support system that enabled the AirLand Battle doctrine to evolve into a more lethal and joint, deep operations doctrine? There are five logical steps that the model will follow in order to chronologically build a foundation of doctrine and thoroughly address and answer the secondary questions. Each of these questions will support a conclusion designed to answer the primary research question.

Phase One: AirLand Battle Doctrine

Phase One will be the examination of AirLand Battle doctrine that US armed forces used to fight the Gulf War. In the mid-1980s doctrine shifted to become more aggressive and offensively oriented in order to maintain the initiative against Warsaw Pact forces in Europe. Based on the implementation of AirLand Battle doctrine detailed in FM 100-5, *Operations*, and augmented with fire support doctrine, this step in the research process will determine if there was a need to develop ATACMS to support that doctrine. One must consider if a comparable capability existed prior to fielding ATACMS. The thesis will examine the Lance missile system and its capability to support AirLand Battle doctrine as a deep fires or SEAD platform.

Phase Two: Operation Desert Storm

Phase Two in the research methodology will determine if ATACMS met or exceeded its design expectations during ODS. Examining in detail the battle damage assessments and lessons learned from deep operations will determine if the doctrine

during ODS supported ATACMS operational employment. ODS generated several reports, AARs, and observations that will substantiate the battlefield performance of the system and show any gaps in the doctrine that would require refinement during the interwar period. Did the implementation and performance of ATACMS during ODS define its role in deep operations doctrine?

Phase Three: Interwar Period, 1991 to 2002

Phase Three will show how command and control and planning fires in support of deep operations changed as a result of ATACMS implementation. During the interwar period between 1991 and 2002, doctrine transformed from a focus on AirLand Battle tenants to joint operations. Did the combat fielding of ATACMS and its use during ODS provide a catalyst to further develop joint doctrine as it relates to targeting and deep operations? The thesis will analyze the joint publications and joint tactics, techniques, and procedures (JTTPs) for targeting and TTPs for ATACMS in order to build a doctrinal foundation to address this question.

Several military officers who fought in ODS concluded that many aspects of ATACMS employment needed to be integrated with other joint systems on the battlefield. In particular, the issue of FSCL placement and its purpose caused much debate. The FSCL is designed to be a permissive fire support coordination measure, but was often used in a restrictive manner during ODS. This caused airspace coordination delays and conflicts hindering the responsiveness of target engagement. Though this thesis will not solve the FSCL debate, its application will add credence to the effect ATACMS implementation had on deep operations doctrine debate and development during the interwar period.

A major subcategory to Phase Three is the examination of the responsiveness and all-weather capabilities of ATACMS and compare those capabilities to that of other deep attack systems. This argument will introduce the significance of attacking time sensitive targets (TST), particularly examining what asset is best suited to attack a specific type of TST under certain conditions. Many field manuals and unit SOPs discuss the role of ATACMS in conjunction with TST nomination and attack.

Phase three will compare and contrast the capabilities of each deep attack system to attack TSTs. The criteria are the following: effectiveness against different target types, responsiveness, range, accuracy, vulnerability to adversary threat, associated risks, and limitations of employment.

Developing the relationship between ATACMS and other deep attack systems will delineate its role in deep operations from the roles of attack aviation and Air Force aircraft. Revolutionary impact does not mean the particular system has to replace all others, but rather that the system impacted doctrine to such a degree, that it provided a capability and an option to engage targets deep that never before existed.

Phase Four: Operation Iraqi Freedom

Phase Four will look in depth at the performance and employment of ATACMS during OIF. Did the successful employment of ATACMS during OIF validate the developed joint doctrine for deep operations? There are several AARs, articles, personal accounts, and professional journals covered in the preceding chapter that will provide the raw data and the technical and tactical achievements of ATACMS in battle. Identifying the difference in doctrinal processes between the two wars is also important. Phase Four

will examine how TTPs for targeting and airspace control improved since Operation Desert Storm.

The effects ATACMS produced during OIF with its responsiveness, accuracy, lethality, and range were unprecedented in warfare. Phase Four will explore how effective ATACMS fires were during the two-day sandstorm. This will help determine if ATACMS was the only asset on the battlefield that could still attack deep targets during those extreme weather conditions.

Phase Four will also examine what units received ATACMS support and the impact that had on defining ATACMS in joint operations.

Phase Five: Conclusions and Future Applications

Phase Five of the research methodology will determine whether or not ATACMS was revolutionary. It will further discuss its purpose in support of Joint Vision 2020. The development of the anti-armor Block II missile would further enhance ATACMS capabilities to support US forces of today and tomorrow. It is important to explore what purpose ATACMS will serve in the future force and determine if the system will maintain its role as a vital joint fire support asset. ATACMS currently provides precisely the right capability of accuracy, responsiveness, and all-weather employment. Will that capability fit into the future force as a means to synergize the joint fight?

CHAPTER 4

ANALYSIS

The analysis will follow the research methodology by answering the questions in sequential and chronological order. Each step in the process builds on previous steps, and if any step during the process is disproved, the conclusion will reflect that outcome. The research question that this thesis must ultimately prove or disprove is, Did ATACMS have revolutionary impact as the fire support system that enabled the AirLand Battle doctrine to evolve into a more lethal and joint, deep operations doctrine?

AirLand Battle Doctrine

Army doctrine evolved during the 1980s and focused on employing the offensive capabilities of US armed forces against a potential Warsaw Pact threat in Europe. The AirLand Battle doctrine transformed from an active defense to a more aggressive doctrine allowing NATO forces to set the conditions on the battlefield through initiative, mass, firepower, and offense. In order to support this radical change in operational doctrine in Europe, the United States had to match that doctrinal shift with weapon systems capable of violently striking the enemy deep. As a result, several weapon systems joined the US armed forces arsenal to include Air Force stealth fighters and bombers, Apache attack helicopters, and tactical ground and air defense missiles.

AirLand Battle doctrine defined combat power as a combination of maneuver, firepower, protection, and leadership (FM 6-20 1988, 1-1). The US Army was unable to achieve overwhelming firepower in deep operations because of limitations in its long range field artillery system. The outdated Lance missile system lacked range, responsiveness, and sufficient volume of fire. This system could only effectively deliver a

nuclear warhead out to 120 kilometers and a convention warhead out to seventy-five kilometers (Global Security 2002, 1). The Lance missile system required seventy-five personnel to support each platform and was able to fire only one missile per iteration (Demma 1989, 228). The Lance missile launcher had a support requirement of seventy-five personnel greatly reducing its responsiveness and volume of fire.

The Army realized that there was no organic capability to attack targets deep without requesting Air Force or Army aviation assets. This placed the ground commander in a situation in which he had to rely on air assets to attack his HPTs at ranges beyond that of his organic systems. This missing capability had an adverse effect on the ground commander's ability to conduct decisive deep operations, thus limiting his offensive capability. Deep operations are critical to create the conditions for a successful offensive operation and victory (FM 100-5 1986, 19).

FM 6-20-30, *TTPs for Fire Support at Corps and Division Level*, addressed the issue of Lance's limited effectiveness in deep fires with the following note, "The conventional Lance warhead has a limited capability for SEAD. Near-term developments in MLRS range capabilities will improve the Army SEAD capability" (FM 6-20-30 1989, App. B). The Army had already begun development of ATACMS during the publication of this document. Many of these SEAD targets fall in the deep area, far beyond rocket and cannon artillery range. This note clearly shows Lance's inability to hit most SEAD targets effectively.

FM 6-20-30 identified the Tactical Missile System (TACMS), later renamed ATACMS, as a deep fires system even though the system was not yet fielded when the field manual was published in 1989 (FM 6-20-30 1989, 4). The manual addressed

ATACMS in the detect phase of the targeting process as requiring specific information on target description, target location, target location error (TLE), and dwell time not longer than thirty minutes to meet the target selection standards for launch (FM 6-20-30 1989, 4-V). These factors were prescriptive enough to develop basic TTPs for developing an attack guidance matrix that would augment the employment procedures for firing ATACMS at the corps level. There is no reference to Lance in the “Deep Operations” section or “Offensive Operations” chapter of FM 6-20-30. The AirLand Battle doctrine referred to ATACMS as a viable Army asset to conduct deep operations. This direct reference in FM 6-20-30, *TTPs for Fire Support at Corps and Division Level*, proves that the doctrine preceding ODS favored ATACMS over Lance as the appropriate system to provide responsive and accurate fires in deep operations.

FM 6-20-30 also listed the following target types as ideal for deep attack: independent tank regiments or battalions; attack helicopter units; command and control nodes; fire direction centers; air defense systems; and nuclear delivery systems (FM 6-20-30 1989, 4-V). The Army designed ATACMS to achieve lethal effects on these target types with its Block I missile. There was, however, an exception. The Block I missile has limited effect on armored targets. The Army developed the Block II missile in order to mitigate this shortcoming. The Block I missile could still disrupt the operations of armored forces by attacking the armored element’s logistics assets and command and control nodes. A combination of Blocks I and II missiles would neutralize an armored unit.

Another key consideration for ATACMS in supporting AirLand Battle doctrine was SEAD fires. SEAD must be timely and accurate in order for their effects to suppress

or neutralize the air defense system at the critical time, affording maximum protection for US aircraft. Lance possessed a very limited capability to conduct a time-on-target mission (TOT). A TOT is a specified time that munitions effects from artillery, rocket or missile fire will impact a target. Timing is critical when conducting SEAD. Planners must coordinate and synchronize the effects of SEAD fires to the second in order to protect friendly aircraft once they are within range of enemy air defenses. Rocket, missile, or air assets must attack enemy air defense systems that can range the flight route to suppress the systems and facilitate safe and unhindered ingress and egress to and from the deep objective area.

MLRS rockets were already capable of conducting SEAD at limited range out to thirty kilometers during the 1980s. One purpose for the development of ATACMS was to extend the range and accuracy of fires in a SEAD role providing the ground force commander a means to conduct his own SEAD without having to rely on additional aviation assets.

SEAD is not the only factor the Army considered when designing ATACMS to support the AirLand Battle doctrine. FM 100-5, *Operations*, first introduced the concept of attacking an enemy in depth using the full range of weapons and assets available. Attacking enemy HPTs with a ground-based missile system was one of those concepts required to successfully fight the fast-paced AirLand Battle. The *Final Report to Congress: Conduct of the Persian Gulf War* following ODS stated the following:

ATACMS replaced the conventional Lance missile system and is used to attack soft, stationary, semi-fixed targets (e.g., surface-to-surface missile sites, air defense sites, logistics sites, and command, control, communications, and intelligence facilities). ATACMS is the operational commanders' deep strike weapon system. (1992, 834)

This report shows that ATACMS replaced Lance as the operational commander's deep attack weapon. This piece of the report ties the intent of fielding and employing ATACMS in combat to the reality of its eventual employment during ODS. This will lead the discussion into the performance of ATACMS during ODS in order to set the foundation for its revolutionary impact on deep operations and to prove it played a critical role in the joint battle.

Operation Desert Storm

ATACMS had a distinct advantage over other Army systems because it was fielded during a war. The question one must ask to show ATACMS had revolutionary impact is: Did the implementation and performance of ATACMS during ODS define its role in deep operations doctrine?

The system went from the proving grounds at White Sands Missile Range directly to Saudi Arabia for fielding. This allowed the Army to test the tactical and operational employment of ATACMS fires with the current deep operations doctrine outlined in FM 6-20-30, *TTPs for Fire Support at Corps and Division Level*. The VII Corps Artillery used ATACMS in the following deep operational roles: SEAD, attack of Corps HPTs, and as a counterfire munition (US Army VII Corps n.d., 5).

The first combat firing of ATACMS was with the Block I missile in conjunction with a deep JSEAD mission against an enemy SA-2 site. The *Final Report to Congress: Conduct of the Persian Gulf War* characterized this first combat firing in the following passage:

Because of the extensive air defense threat, coordination among the Services to provide mutual support was essential to Operation Desert Storm's success. The JFACC tasked apportioned SEAD sorties, guaranteeing a coordinated, effective, and prioritized SEAD effort. Almost all Coalition aircraft contributed. In their

first combat use, ATACMS demonstrated a rapid response capability. A Multiple launch rocket system launcher, armed with ATACMS, received a fire mission while moving in convoy, occupied a hasty firing position, computed firing data and launched a missile that neutralized an SA-2 site. (1992, 214)

This demonstration of responsiveness, lethality, and accuracy set the stage for the remaining ATACMS missions fired during ODS. There was an immediate requirement to neutralize the enemy SA-2 site. The MLRS battery was conducting convoy operations and did not have pre-established firing points. The ability to conduct an emergency fire-mission with a missile never before fired in combat is quite phenomenal. ATACMS proved from its first fire mission that it was capable of firing with little or no notice and could achieve the desired effects.

This example also demonstrated joint fighting in that the JSEAD mission originated from the JFACC in support of maintaining air superiority for the air component (US Congress 1992, 214). No other fielded system in the joint spectrum could have neutralized that SA-2 site with such responsiveness. Air Force aircraft could have engaged the SA-2 site, but the tactical situation would have required them to be in close proximity to achieve a quick engagement. That would have made it a high-risk mission for a fixed-wing aircraft, since that SA-2 site was active. Although fighters are fast and lethal, they are more vulnerable to attacks from enemy SAMs, and thus, cannot assume a role of ubiquity on the battlefield. The outcome from this first combat use shows that ATACMS was a key contributor to deep fires and JSEAD in conjunction with attack aviation during ODS.

ATACMS functioned in a joint role during ODS through the target acquisition process. A useful and effective means for identifying major enemy and friendly troop movements was through the Air Force's joint surveillance target attack radar system

(JSTARS) (US Congress 1992, 797). JSTARS is a Boeing 707-300 chassis with the primary function of ground surveillance (Global Security 2003, 1). The VII Corps received a ground station module with a direct data link to JSTARS (US Congress 1992, 796). JSTARS was able detect, locate, and track a variety of HPTs while in movement and transmit those to the ground station module (US Congress 1992, 797). Those targets included Scud launchers, convoys, river crossing sites, assembly areas, and logistical resupply points (US Congress 1992, 797). The VII Corps used JSTARS acquisitions as a responsive means to plan ATACMS targets (US Army VII Corps n.d., 6). ATACMS Block I missiles were in short supply during ODS, and the VII Corps commander had to ensure that each missile achieved optimum effects. He insisted on JSTARS validation before firing most missions (US Army VII Corps n.d., 6).

ATACMS continued to prove its joint capability during ODS through the close integration with JSTARS. Showing that the first JSEAD mission was in support of the air component, and that the primary detect interface for ATACMS was JSTARS, clearly defines ATACMS as a valuable Army asset supporting the JFC's joint fight.

The following caption is in reference to the special operations deep attack to set the conditions for the ground offensive. ATACMS did not support this mission. "Even before the fighters struck Iraqi targets, three USAF MH-53J Pave Low special operations helicopters from the 1st Special Operations Wing (SOW) led nine Army AH-64 attack helicopters from the 101st Airborne Division (Air Assault) on a mission into southern Iraq" (US Congress 1992, 169). One could argue that ATACMS could have had a role in this secret deep operation. However, the facts are unclear. ATACMS requires a TLE of 150 meters or less to achieve devastating results. The JFC may not have known the hard

target data at the time, and as a result, had to send in radar-evading special operators and low-flying attack helicopters to develop the situation in order to detect and destroy the enemy targets. This would have also preserved the element of surprise until the last possible moment. ATACMS did conduct JSEAD missions during D-day and D+1 by firing ten missiles in support of Air Force deep strikes.

The VII Corps and Army Component Central Command (ARCENT) employed ATACMS as a deep asset in support of joint operations as described above. There were a total of twenty-four Block I ATACMS missions fired during ODS requiring thirty-two missiles (US Army VII Corps n.d., 7). There were eleven deep JSEAD missions, two logistics site attacked, five multiple rocket launchers (MRL), one bridge with convoy, and five surface-to-surface missile sites (US Army VII Corps n.d., 7). Six of the enemy air defense targets were destroyed or neutralized. In reference to the remaining air defense sites targeted the *Final Report to Congress: Conduct of the Persian Gulf War* stated, “ATACMS apparently silenced targeted air defense sites; electronic emissions ceased soon after sites were attacked by ATACMS. Coalition aircraft flying through flight corridors cleared by ATACMS strikes reported no enemy air defense radar activities” (US Congress 1992, 835). As a result of the successful JSEAD strikes, ARCENT requested the use of all available ATACMS assets to support the ground campaign (US Congress 1992, 835).

Air Force assets also benefited from the responsiveness of ATACMS fires. An A-10 pilot called in an immediate strike mission that caused great destruction on enemy forces. To support that mission, the 6-27th Field Artillery fired Block I ATACMS at the critical bridge; the result was 200 destroyed light-skinned vehicles attempting to cross the

bridge (US Congress 1992, 835). The responsiveness and destructive effects of ATACMS proved to be the appropriate system to attack that bridge. Timing and precision were critical to achieving the effects required to destroy the convoy. The report goes on to characterize ATACMS as a highly responsive system after analyzing the effects achieved from its twenty-four fire missions (US Congress 1992, 836). These performance parameters and characteristics built the foundation for integrating ATACMS into the joint deep operations doctrine developed during the interwar period.

Final observations on ATACMS and MLRS performance during ODS were overwhelmingly positive. The MLRS, though fielded in the early 1980s, also fired its first rockets in combat during ODS. The M270 is the chassis that fires the ATACMS missile as outlined in Chapter 1 of this thesis, and pointing out a few of its contributions in survivability and reliability will support the argument of ATACMS impact.

The accomplishments outlined in the *Final Report to Congress: Conduct of the Persian Gulf War* stated that MLRS was lethal at long ranges against a variety or target types (1992, 836). It also stated that the system could fire missiles and rockets under extremely harsh weather conditions during the daytime and at night (US Congress 1992, 836). One could infer from this that the capability to achieve lethal effects under those weather conditions did not exist before nor was there another platform on the battlefield at the time with that capability. “MLRS was very maneuverable and was the only field artillery system that kept up with fast-paced maneuver advances” (US Congress 1992, 836). In an open environment, speed and mobility are paramount to maintaining the offensive momentum in battle and ensuring an attacking army does not lose the initiative. The MLRS launcher fit this mold perfectly during ODS by being able to advance with

M1 tanks at a rapid and violent pace, while conducting emergency fire missions with rockets and missiles.

Perhaps the most critical observation stated in the Final Report was: “ATACMS accuracy met or exceeded operational requirements, and ATACMS destroyed or silenced most targets attacked” (US Congress 1992, 836). Therefore ATACMS triumphed as a deep attack system by improving all-weather capability, responsiveness, accuracy, range, lethality, and maneuverability of the MLRS and by replacing the obsolete Lance missile system.

ATACMS clearly met design parameters and the Army’s expectations during ODS as an Army organic deep attack system that neutralized or destroyed numerous enemy targets in support of air and ground operations. Its ability to attack a wide array of targets during ODS proved its usefulness and conducting deep operations. FM 6-20-30, *Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations*, addressed each of those engaged target types when referring to deep operations. Those target types include the following: command and control nodes, logistics sites, ballistic missile sites, aviation staging areas, air defense sites and, transportation loading site (FM 6-20-30 1989, 8).

The planning and execution of ATACMS fire missions during ODS followed the AirLand Battle doctrine for deep operations as outlined in FM 6-20-30. ATACMS fires adhered to the following TTPs listed in FM 6-20-30 during ODS: SEAD fires; deep attack against logistics SSM sites; attack of command and control nodes. This relationship between the AirLand Battle doctrine and the effects ATACMS had in deep operations provided the link that tied doctrine to the successful performance of

ATACMS. The conclusion to this phase in the analysis is that ATACMS did successfully execute AirLand Battle doctrine during ODS and met or exceeded all expectations as a premier, deep attack weapon system.

Changes in Command and Control during Interwar Period

Did successful combat execution of ATACMS during ODS provide a catalyst to further develop joint doctrine as it relates to targeting and deep operations? Both Army and Air Force doctrine evolved during the interwar period. In particular, the Army published the new version to FM 100-5, *Operations*, in 1993 under the authority of General Franks, the TRADOC Commander and VII Corps Commander during ODS (Laugbaum 1999, 46). One primary reason for moving away from the term “AirLand Battle” and focusing more on the term “Operations” was to allow the Army to command and control its organic long-range weapons in the deep battle without having to rely on Air Force command and control resources (Laugbaum 1999, 46). Operations are not service component specific and gives the Army more of a joint focus in its doctrine. This shift away from AirLand Battle doctrine helped establish the Army in the joint battle as a service component that could command and control assets with direct impact on deep operations. FM 100-5 dedicated a complete chapter to joint fighting. This established a foundation for the development of joint doctrine during the mid-1990s and showed the emphasis and importance the Army applied to joint doctrine and the joint fight.

During ODS Joint-TTPs supporting AirLand Battle doctrine were not advanced or developed enough to overcome airspace coordination and deconfliction problems that arose between air and ground components. As a result several ATACMS missions requested to strike time sensitive targets (TST) during ODS were cancelled due to

lengthy airspace coordination lasting up to two hours (Francis 1992, 87). This clearly showed that the joint force required improved doctrine to employ this responsive asset against TSTs and HPTs in support of the JFC's targeting objectives.

The Army restructured the battlefield coordination element used during ODS by publishing FM 100-13, *Battlefield Coordination Detachment (BCD)*, in 1996 (Laugbaum 1999, 50). After numerous after action review (AAR) comments claiming the battlefield coordination element was understaffed and possessed inadequate communication systems, the Army created the BCD with the primary mission of integrating and synchronizing Army maneuver and fires into joint operations (Laugbaum 1999, 50).

Although the BCD did help deconflict deep fires and synchronize ATACMS and Apache operations with Air Force operations, the issue of service component command and control still existed as it pertained to the FSCL. In Army doctrine the FSCL is a permissive FSCM that allows for the attack of deep targets without detailed coordination. During ODS the Air Force saw the measure as restrictive because they required clearance from the ground commander to attack targets short of the FSCL (Hall 2000, 21). The goal within the confines of joint doctrine was to establish a common definition of the FSCL that enabled maximum firepower effects against enemy targets with minimum coordination, regardless of the target's location in relation to the FSCL. The ultimate objective of attacking a target or series of targets is to achieve certain effects in a timely manner.

JP 3-0, *Doctrine for Joint Operations*, attempts to clarify the FSCL's purpose and states that the ground or amphibious force commander is responsible for establishing the measure (JP 3-0 2001, GL-9). The FSCL does not divide operations or act as a boundary,

nor does it give command and control authority to any particular service component. Its primary role is to facilitate expeditious ground, air, or sea-based attack of surface targets beyond the coordination measure (JP 3-0 2001, GL-9). Joint doctrine clarified the purpose of the FSCL as a permissive FSCM within the joint community. This facilitated maximizing lethal effects in the deep target area while reducing the requirement for extensive airspace deconfliction and coordination.

Clarifying the purpose and authority of the FSCL is an important aspect to the joint doctrinal shift that took place during the interwar period. Joint doctrine does not favor either service regarding the FSCL's implementation or purpose. ATACMS fires will almost always strike beyond the FSCL, and joint doctrine has evolved to safely and expeditiously integrate its effects into deep operations.

In addition to a more clearly defined understanding of the FSCL, joint doctrine also expresses how the flight characteristics of ATACMS only create small corridors of airspace that require clearance. “The high angle of launch and impact (of ATACMS), along with a very high altitude flight path, does not require large amounts of airspace to be deconflicted prior to firing” (US Joint Forces Command 2002, IV-3). The missile’s trajectory, velocity, and steep rates of accent and decent demonstrate its differing flight characteristics from that of convention cruise missiles or MLRS rockets. This allows for more simplified airspace deconfliction and coordination at the ATACMS missile launch site and target area.

The flight characteristics described above give ATACMS another advantage in conducting deep attacks early in a campaign. ATACMS possesses the capability to strike targets before air superiority is achieved. The JFACC will typically have the mission to

establish air superiority in an immature theater of operations as one of its first objectives. ATACMS can support the air superiority mission and simultaneously engage other HPTs during this phase. Air Force aircraft, and potentially Apaches, will have to destroy enemy surface-to-air missiles (SAM) and enemy aircraft in order to achieve air superiority. When the enemy air defense belt is too dense to risk fixed-wing aircraft on deep missions, ATACMS is a viable system to strike SAM sites and other HPTs. The flight characteristics of an ATACMS Block I missile at the launch site are displayed in figure 1. This steep rate of ascent and its high velocity increase the missile's survivability making it difficult for enemy air defense systems to engage it.

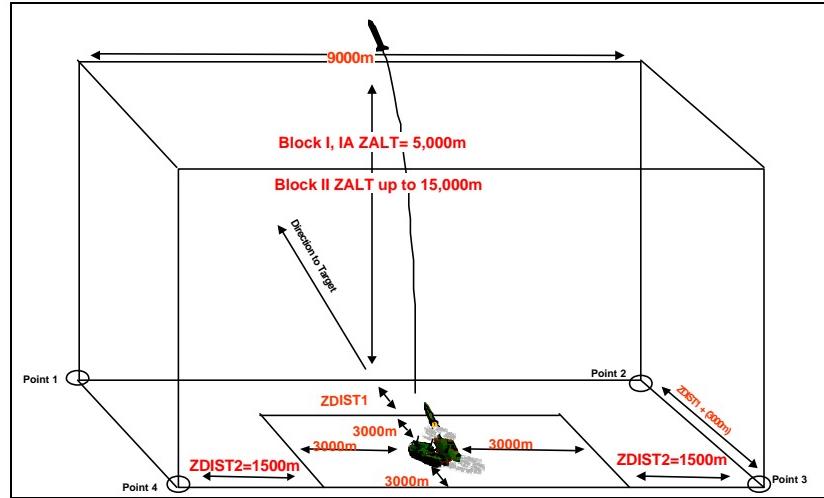


Figure 1. Platoon Air Hazard ROZ

Source: ST 6-60-30 1999, 20.

ST 6-60-30, *The Army Tactical Missile System (Army TACMS), Family of Munitions (AFOM), Tactics, Techniques and Procedures*, describes its survivability against enemy air defense as follows: “The Block I or IA missile is generally not

vulnerable to short-range, low-altitude air defense weapons. However, some potential enemies possess long-range, high-altitude air defense assets that are marginally effective against a Block I or IA missile" (1999, 9-10). These survivability characteristics also increase ATACMS usefulness in joint, deep operations. As an all-weather, highly survivable, accurate, and lethal system, ATACMS gives joint planners an asset that can fit varying situations when planning and executing deep operations.

The headquarters planning the ATACMS deep operation must submit the preplanned flight routes pertaining to the launch site and target area through the battlefield coordination detachment (BCD) to ensure the routes are synchronized and deconflicted with the air tasking order (ATO) cycle (US Army V Corps 2001, 3-A-2). The active restricted operating zones (ROZ) would be visible to the JFACC and Joint Task Force in order to prevent fratricide. Figure 1 depicts the ROZ at the launcher site called a platoon air hazard (PAH), and figure 2 depicts the ROZ at the target location called a target air hazard (TAH) (ST 6-60-30 1999, 20). The dimensions and activation times for these hazards will appear on the ACO, if preplanned, and will be deconflicted with the ATO.

A target of opportunity, such as a TST, will require additional coordination. These types of targets generate a new TAH ROZ that would not be preplanned on the ATO or ACO and need to be cleared of aircraft before firing (figure 2). JFACC will have to remain alert to the active PAH ROZs listed in the ACO and will then have to clear the airspace associated with the target of opportunity. If a target of opportunity requires immediate attack, an MLRS platoon with an active PAH ROZ will fire the mission (US Army V Corps 2001, 3-A-2). If aircraft are not clear of the PAH or TAH for a particular

target or opportunity, this will cause a delay in airspace coordination. Placing pre-planned ATACMS missions on the ATO gives them visibility to all service components. The MLRS launcher can fire the mission regardless of weather and enemy air defense posture. ATACMS has had a dynamic impact on the joint airspace command and control as demonstrated in this procedure.

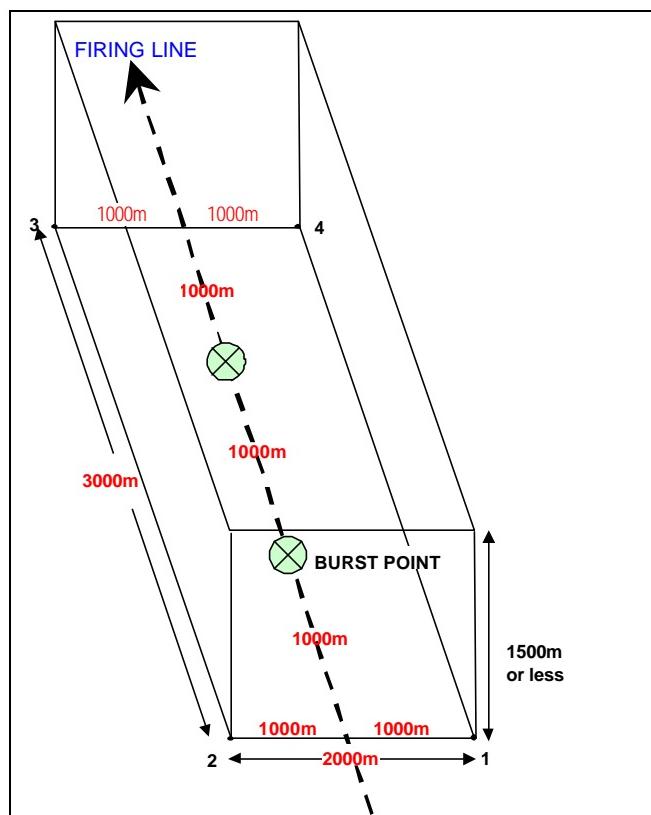


Figure 2. Default Block I and IA Target Air Hazard ROZ

Source: ST 6-60-30 1999, 21.

The development of SOPs and TTPs at operational-level commands gave staffs the tools they required to properly plan, coordinate, and synchronize ATACMS missions. The final phase to refining the doctrine preceding OIF was how best to engage TSTs.

Time Sensitive Target Capabilities Comparison

The ATACMS missile is lethal, responsive, and possesses the capabilities and characteristics required to effectively attack TSTs. This section will compare and contrast different deep attack systems and their ability and inability to attack TSTs under varying conditions on the battlefield.

The JFC has the authority to designate TSTs requiring immediate action because they are either an imminent threat to his forces or the target is very lucrative and will yield a high payoff (JP 3-60 2002, vii). As described in chapter 2, major commands have incorporated specific procedures for planning and executing TSTs. US Central Command (USCENTCOM) is currently the Combatant Command in Iraq. Its SOP calls for ATACMS and attack air as the primary means to engage TSTs (US Joint Forces Command 2002, I-1). A joint TST requires cross coordination involving two or more components to successfully attack. This thesis focuses in on TSTs, because they are tied to the commander's targeting objectives and are of the highest priority during the joint fight.

There are numerous systems in the joint arsenal that can effectively attack joint TSTs. The systems to compare and contrast are: ATACMS, cruise missiles, fixed-wing aircraft, and rotary-wing aircraft. The criteria used in comparing the systems are the same criteria listed in the *Commander's Handbook for Joint Time-Sensitive Targeting*. They are the following: effectiveness against different target types, responsiveness, range, accuracy, vulnerability to adversary threat, and associated risks and limitations of employment (US Joint Forces Command 2002, IV-2).

Responsiveness

The first element to compare is responsiveness. ATACMS is very responsive as described in the following segment of the ATACMS TTPs, “the commander can maintain flexibility by retaining launchers and missiles immediately available to him for rapid attack of high payoff immediate targets” (ST 6-60-30 1999, 16). The JFC would specify in his targeting guidance what on-call assets he would like to allocate to respond to unplanned or immediate TSTs. If there are no airspace coordination conflicts, ATACMS could put its effects on the TST at maximum range in under ten minutes.

Cruise missiles are not responsive. “The required lead-time to plan and execute cruise missile missions could be a limiting factor against TSTs” (US Joint Forces Command 2002, IV-2). *USAREUR-USAFFE Joint TTPs for Command and Control of Joint Fires* does not discuss cruise missiles as a means to attack TSTs (USAREUR- USAFE 2000, 6-5 - 6-8). The cruise missile’s inability to rapidly respond to an unplanned or immediate TST renders it ineffective in this argument.

Fixed-wing aircraft have the ability to move long distances quickly in order to mass effects onto a target. They are responsive, but have limitations of communications and weapons payload. Each aircraft carries a mission-specific weapons payload. If the weapons payload does not support the effects required against a particular TST, that aircraft would not be suited for the mission. An advantage fixed-wing aircraft have over all other systems is their ability to loiter and quickly divert in-flight to attack another target (US Joint Forces Command 2002, IV-3). This would only be possible; however, if US forces had achieved air superiority and communications were maintained with the aircraft while in flight.

Rotary-wing aircraft provide relatively little responsiveness compared to other systems in engaging TSTs because of their slow traveling speed. Attack aviation is typically used to conduct deep attacks against pre-planned and specific targets or conduct fire support in conjunction with maneuver forces. Their ability to attack an unplanned or immediate TST is limited. Attack helicopters would be able to attack the TST only if the target acquired were in the general vicinity of the attack aviation unit's current area of operations, and they were given the "be prepared to mission" to execute TST strikes. As stated in *USAREUR-USAFFE Joint TTPs for Command and Control of Joint Fires*, "Attack helicopters can launch rapidly to attack surface TSTs; however, slower enroute times and range limitations must be considered when the decision to employ them is contemplated" (USAREUR-USAFFE 2000, 6-8). Attack helicopters are capable of attacking TSTs, but their limitations in range, speed, and all-weather operability will reduce their responsiveness to attack.

Range and Accuracy

The next two criteria to compare are range and accuracy. ATACMS Block IA can fire out to 300 kilometers and can achieve 57 percent fractional damage to the target when the known location is within 150 meters (ST 6-60-30 1999, 10). This means that the transmitted target location can be up to 150 meters inaccurate, and ATACMS would still deliver acceptable effects to neutralize the target. Figure 3 depicts this relationship between TLE and fractional damage and identifies 57 percent destruction at the 150-meter mark as the recommended acceptable destruction level for commanders (ST 6-60-30 1999, 10). This standard applies to both the Block I and IA missiles; the GPS-aided, inertial-guided system in the Block IA increases its accuracy thus giving it the same TLE

as its more heavily armed Block I missile (ST 6-60-30 1999, 4). The bottom line is that ATACMS is extremely accurate, and with fairly precise target location data, ATACMS is capable of destroying or neutralizing the target.

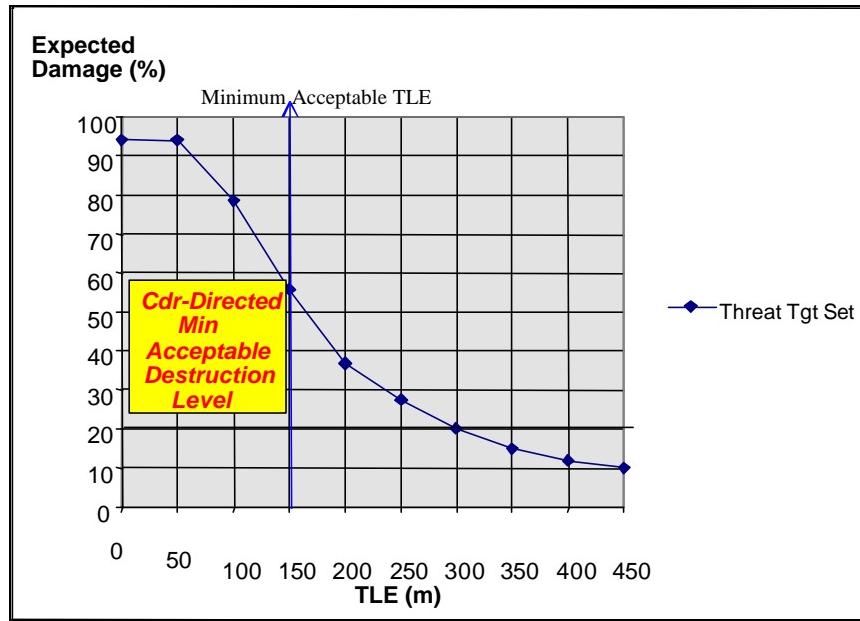


Figure 3. Expected Damage and Target Location Error Relationship for Blocks I / IA
Source: ST 6-60-30 1999, 10.

Fixed-wing aircraft are very accurate and can range the entire theater of operations in relatively short order. “Because the aircrew can provide “eyes on” during the attack, manned aircraft are of particular advantage when attacking mobile targets or when exact target coordinates are unavailable” (US Joint Forces Command 2002, IV-3). This is an advantage over other systems, because the aircraft can seek out and find a target, when its exact location is not known. “Fighter and attack aircraft can rapidly respond to surface TSTs provided they are airborne and in communication with the C2

platform.” (USAREUR-USAFAE 2000, 6-6). This means that fixed-wing aircraft would be dedicated to an area of responsibility for a determined period of time in order to react to TSTs and other targets of opportunity. Another way that fixed-wing aircraft can attack TSTs is through the airborne divert mission, taking them away from a pre-planned mission and diverts them to the higher prioritized TST in their operating area (USAREUR-USAFAE 2000, 6-6).

Rotary-winged aircraft are also very accurate with the ability to use a wide-array of weapon systems. The major limitation is its range because it is slow moving and has little defensibility against enemy air defense. In order to compensate for their lack of speed, attack aviation assets should be located in a forward holding area in closer proximity to the suspected enemy TSTs (USAREUR-USAFAE 2000, 6-8). The AH-64 Apache has a maximum range of 260 kilometers giving almost as much reach as ATACMS Block IA (US Congress 1992, 758). Once the attack helicopter reaches the target, its weapon systems are both accurate and lethal and will effectively neutralize or destroy the target.

Associated Risks and Limitations

The final factors to compare are vulnerability to enemy attack and associated risks and limitations. The MLRS launcher is an armored vehicle that is highly maneuverable. Its vulnerabilities are enemy air attack and counterfire from enemy artillery or rocket systems. Doctrine dictates that each launcher maneuver to its hide location after firing and establish secondary firing positions to increase survivability (FM 6-60 1996a, 4-III). This procedure limits the enemy’s ability to detect the rocket or missile signature and put

the launcher in a covered and concealed location away from the firing point immediately after firing.

The missile itself is very survivable as explained earlier in this chapter. Its rate of ascent and decent coupled with its nine kilometer-wide flight corridor make it very difficult for enemy anti-missile defenses to engage (II German/US Corps 2002, B-11).

The primary advantage ATACMS has over the other deep attack systems is its all-weather capability. The missile functions under the harshest of weather conditions, where fixed and rotary-winged aircraft could not operate as effectively. This was proven during ODS and OIF when sandstorm wind velocities approached 160 kilometers per hour. Under these conditions, ATACMS was the only asset that could effectively attack TSTs.

Fixed-wing aircraft have limited capabilities in extreme weather conditions. Though, they possess enhanced day and night capabilities through advanced navigation and target acquisition systems, it is difficult for the crew or pilot to acquire targets and engage them under harsh environmental conditions. These aircraft are also more vulnerable to enemy air defense systems, and in a high threat environment, will require SEAD fires to avoid unacceptable risks to aircraft and aircrews (US Joint Forces Command 2002, IV-3).

The same limitations apply to rotary-wing aircraft. Their systems allow for day and night operations under moderate or favorable conditions. If the weather conditions deteriorate, they still can operate, but with degraded capability. Under extreme conditions, their effectiveness becomes negligible. Attack aviation's primary disadvantage is its poor air defensive posture. Helicopters are slow-moving and low-flying, making them prone to all levels of enemy air defense from SAMs to individual

small arms. Sending fixed-wing aircraft after a TST deep without a pre-coordinated SEAD plan is a high risk mission.

After analyzing the advantages and disadvantages of these systems to attack unplanned or immediate TSTs, ATACMS and fixed-wing aircraft are the most reliable assets for the mission. Both systems are responsive and accurate and can engage a wide array of target types. The two primary advantages that ATACMS has over fixed-wing aircraft are its all-weather capability and survivability against enemy air defense. Fixed-wing aircraft have the advantage of not requiring as precise of a target location to acquire and attack. ATACMS Block II does mitigate this difference; however, Block II can attack moving targets traveling up to fifty kilometers an hour with the sensor assistance of JSTARS, unmanned aerial vehicles (UAV), or special operation forces (SOF) (ST 6-60-30 1999, 43).

The chart depicted in Figure 4 is a decision matrix which assigns a ranking to each deep attack system as it applies to the criteria for attacking TSTs. The purpose of the matrix is to closely represent the above written analysis for each criterion considered in joint doctrine for attacking TSTs. Each weapon system is compared to each criterion and assigned a ranking score of one to four. One is the most effective system and four the least effective. Responsiveness is most directly addressed in the joint doctrine, so its assigned weight is two. Range and accuracy are next in importance and have a weight 1.5. The lowest factors are associated risks and limitations with a weight of one. These weights are based on importance as outlined in this thesis, in JP 3-60, *Joint Doctrine for Targeting*, and in the *Commander's Handbook for Joint Time-Sensitive Targeting*. The

numbers on the far right of the chart represent the most appropriate systems to attack TSTs ranking from lowest values to the highest values.

Table 1. Ranking Deep Attack Systems against TST Attack Criteria						
	Responsiveness	Range	Accuracy	Risks	Limitations	Results
Weights →	2.0	1.5	1.5	1.0	1.0	
ATACMS	1.5	2.5	2.0	1.0	1.0	<u>11.75</u>
Fixed-Wing Aircraft	1.5	1.0	2.0	3.0	2.5	<u>13.00</u>
Rotary-wing Aircraft	3.0	2.5	2.0	4.0	2.5	<u>19.25</u>
Cruise Missiles	4.0	4.0	4.0	2.0	4.0	<u>26.00</u>

The lower the score is, the more effective that respective system is at attacking TSTs based on the above criteria. The results place ATACMS slightly ahead of fixed-wing aircraft with a score of 11.75 to 13.00 respectively. Because ATACMS has fewer associated risks and performs better under extreme weather conditions, it scored slightly better than fixed-wing aircraft and is, therefore, the system of choice for attacking TSTs.

Operation Iraqi Freedom

The V Corps Artillery fired 414 ATACMS missiles in support of combat operations during OIF which included the first combat firing of Block IA and ATACMS Unitary rounds (Janosko and Cheatham 2003, 33). USCENTCOM included ATACMS in the initial strike on Baghdad at 1519 hours Zulu on 20 March 2003 through the execution of Fire Plan “Unitary” (Janosko and Cheatham 2003, 35). The 2d-4th FA (MLRS) fired thirteen unitary ATACMS representing V Corps’ opening deep strike against Iraqi HVTs;

V Corps synchronized the unitary missile attacks with USCENTCOM's initial cruise missile strikes (Janosko and Cheatham 2003, 35).

Integrating the unitary missiles in OIF's opening strike showed the level of confidence senior leaders had in ATACMS and its capabilities. During ODS, ATACMS supported firing JSEAD missions early in the fight, but were not included in the initial AH-64 raid against key enemy radar targets. Those raids initiated the ground war. The Apache strikes that preceded D-day during ODS were led by special operators and were covert in nature. It was likely that USCENTCOM did not know the exact location of those key radar facilities, and therefore required covert sensors to detect the targets before the AH-64s could attack them. The targets that USCENTCOM identified for ATACMS Unitary attack were known to be corps and division command posts approximately 210 kilometers from the launch site (Janosko and Cheatham 2003, 35).

ATACMS demonstrated its capability to support joint operations to a higher degree during OIF by firing in support of the First Marine Expeditionary Force (I MEF) in theater. The I MEF coordinated the firing of ninety ATACMS missiles at enemy artillery units, command and control nodes, and stationary armored and mechanized formation (Pitts 2003, 10). The thirteen Block IA Unitary fell under the command and control of the I MEF which indicated the progress the joint force has made in integrating assets from other services into their scheme of fires and maneuver. ATACMS was a key shaping tool for the I MEF, allowing more freedom of maneuver with little or no threat from enemy artillery.

Perhaps the most impressive performance characteristic that ATACMS demonstrated during OIF was its ability to continue the fight under the most extreme

environmental conditions. Fred Baker, a journalist at Fort Sill, published an article for TRADOC setting ATACMS apart from other deep attack systems: “Multiple launch rocket system unit provides Operation Iraqi Freedom fires when nothing else can” (2003a, 1). The article explains that during the sandstorm, JFLCC had to maintain operational tempo of the battle by continuing to put pressure on the enemy’s forces deep with ATACMS (Baker 2003a, 2). With the exception of a few JSTARS-controlled CAS attacks at high altitude above the sandstorm (Hollis 2003, 12), ATACMS attacked the majority of deep targets with 50 Block I missiles (Baker 2003a, 2). At one point during the sandstorm, the V Corps Chief of Staff BG Hahn communicated to the 214th FA Brigade Commander, COL Boozer, that his fires were so effective that he has no remaining targets for him to attack (Baker 2003a, 2).

Extreme conditions in the environment and weather do not affect the accuracy of the ATACMS missile, regardless of type. The known location of the target must be within 150 meters, defined as target location error (TLE), in order for ATACMS Blocks I and IA to achieve the commander’s minimum acceptable destruction level of 57 percent (ST 6-60-30 1999, 10). Figure 3 depicts the destruction level of Blocks I and IA based on the TLE. ATACMS can continue to provide effects with a TLE as large as 450 meters, but would only achieve 10 percent destruction level at that range (ST 6-60-30 1999, 10).

The circumstances that would prevent an ATACMS strike from achieving the desired destruction level are the following: inaccurate target location; excessive elapsed time between acquisition of target and impact; or target beyond missile range. Shortly after the Unitary strike, three MLRS battalions fired a series of ATACMS strikes totaling sixty-four missiles against the Iraqi 11th Infantry Division’s air defense, artillery,

counter-battery radar, and command and control nodes (Janosko and Cheatham 2003, 35). The strikes yielded unquestionable effects by disrupting the Iraqi's ability to command and control their maneuver forces and by denying their artillery the ability to mass; ATACMS rendered the 11th Infantry Division combat ineffective (Janosko and Cheatham 2003, 35).

There was increased flexibility during OIF that allowed the V Corps and JFLCC commanders to fire ATACMS at a wide array of target types and with little delay. This flexibility existed because of the increased supply of Block I and IA missiles on hand and the relatively short mission processing and airspace clearance times required to fire. The average mission processing and airspace clearance time during OIF was seven minutes, compared to just over an hour as seen during ODS (Pitts 2003, 8). The fire mission processing time decreased as a result of implementing joint doctrine and JTTPs developed during the interwar period.

The mobility of the M270A1 launcher proved again during OIF to be a critical component of operational flexibility. On 23 March 2003 the V Corps Commander required ATACMS to fire a critical SEAD mission in support of the 11th Attack Aviation Regiment's deep attack against the Medina Republican Guard Division (Janosko and Cheatham 2003, 35). The current location of the 214th Field Artillery Brigade's ATACMS shooters were not in range to fire Block I missiles at the appropriate SEAD targets, and the supply of Block IA missiles was too limited for that element to remain in place (Janosko and Cheatham 1999, 35). V Corps G3 coordinated to have the MLRS batteries move quickly south and occupy new position areas for artillery in order to achieve the range required to attack the planned SEAD targets (Janosko and Cheatham

1999, 35). At 2100 hours Zulu that day, 214th FA Brigade fired twenty-nine Block I and three Block IA missiles in conjunction with the 11th Aviation Regiment's deep attack; ATACMS also simultaneously attacked enemy artillery and maneuver elements of the Republican Guard Division adding to the lethality of the deep operation (Janosko and Cheatham 1999, 35-36). The ability to move rapidly, occupy new fire positions in short order, and conduct complex and simultaneous attacks deep testifies to unprecedented impact ATACMS had on Corps and JFLCC-level deep operations.

The significant improvements in joint doctrine, JTTPs, and through the use of the *Commander's Handbook for Joint Time-Sensitive Targeting* gave leaders a means to develop unit-level TTPs and SOPs that allowed for better integration of ATACMS fires in joint, deep operations. This proved true during OIF as ATACMS fires were overwhelmingly successful in neutralizing and destroying enemy targets.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The primary purpose of this thesis is to examine what impact ATACMS had on joint, deep operations doctrine and determine if that impact was revolutionary in nature or merely an evolutionary progression of missile technology and tactics. There are five analysis phases to the thesis. The first two phases begin with defining the original intent for development of ATACMS as a system to replace Lance and how it performed within the confines of current doctrine during the first Gulf War.

ATACMS fully met its expectations as an Army missile platform during ODS. The AirLand Battle doctrine that the US Army used to fight ODS allowed for the full integration of ATACMS fires in the following roles: JSEAD, deep attack, pre-planned and on-call attack of high payoff targets. During ODS the ground commander controlled ATACMS as a deep fire asset that attacked targets beyond the FSCL, requiring new TTPs in order to simplify airspace coordination while maximizing effects. The successful performance of ATACMS during ODS and the airspace command and control issues it presented drove the development of joint doctrine for deep operations. Joint TTPs supported joint doctrine and placed ATACMS in the forefront as an asset used for attacking time sensitive targets, high payoff targets, and targets supporting deep SEAD. The conclusions to the first two phases of the research methodology are that ATACMS met its design specifications, and planning and execution of ATACMS fires during ODS proved to fully support AirLand Battle doctrine for deep operations.

Phase Three of the research model details the impact that planning, coordinating, and executing ATACMS fires had on joint doctrine during the interwar period. After examining JP 3-60, *Joint Doctrine for Targeting*, and *Commander's Handbook for Joint Time-Sensitive Targeting*, it is clear that joint doctrine evolved by including ATACMS as a primary deep attack weapon system available to the JFC and the commanders at the JFACC and JFLCC levels. Joint doctrine gave ATACMS detailed consideration which led to the development of Army and Joint TTPs as described in *USAREUR-USAFE Joint TTPs for Command and Control of Joint Fires* and ST 6-60-30, *The Army Tactical Missile System (Army TACMS), Family of Munitions (AFOM), Tactics, Techniques and Procedures*. These TTPs provided US Armed Forces with the tools required to maximize effects of ATACMS in deep operations and to minimize the requirement for extensive and ponderous coordination and deconfliction.

Phase Three also determined that ATACMS and fixed-wing aircraft are the weapons of choice for the JFC, JFACC and JFLCC commanders when attacking TSTs. ATACMS has the advantage of all-weather capability placing it in a unique category as a stand-alone system to attack enemy TSTs under extreme weather conditions. The conclusion for Phase Three is that ATACMS fires during ODS forced joint doctrine and JTTPs to evolve by integrating ATACMS into joint, deep operations as a missile system able to attack TSTs, HPTs, and SEAD targets with responsiveness, accuracy, and lethality. ATACMS is the lethal asset of choice for attacking TSTs out to 300 kilometers.

Phase Four examined how ATACMS performed during OIF using joint doctrine and JTTPs as guides to planning, coordinating and executing deep fires. Each armed service performed in an outstanding manner during OIF using joint doctrine, JTTPs, and

refined SOPs to bring US joint attack weapon systems to bear at the decisive point in deep operations. The 414 ATACMS missiles fired in Iraq were fully integrated, coordinated, and synchronized with the joint concept of the operation. ATACMS missiles attacked deep operations targets under extreme weather conditions when no other asset was available or capable. The fires were accurate, responsive, and lethal and were unprecedented in warfare.

All service components benefited from ATACMS fires because of its ability to strike with pinpoint accuracy out to 300 kilometers and deliver its effects onto the target at a precise point in time. Through the progression of joint doctrine and JTTPs and after examining the success of ATACMS during ODS and OIF, this thesis concludes that ATACMS clearly had revolutionary impact on joint, deep operations. This revolutionary impact enabled AirLand Battle doctrine to evolve into a more joint, deep operations doctrine.

Recommendations

The United States Army should pursue further development of MLRS, ATACMS, and HIMARS. The ATACMS family of munitions provides the operational-level commander with an asset that can range most of the battlefield and deliver its effects quickly. Further development with extended range ATACMS would give the JFC a reach out to 500 kilometers. The Block II missile is a fully tested tank killer that could aid Apaches or Air Force aircraft in neutralizing a moving or stationary armored force during deep operations. The Block IA Unitary missile can deliver a 500-pound warhead to a point target with limited collateral damage. All of these munition types complement joint and deep operations will fit nicely into the future force concept.

As a light alternative to MLRS, HIMARS would fit the force structure of a light division or armored cavalry regiment. HIMARS has the ability to support remote operations with special operations forces or light forces because of its transportability and relatively small logistics tail. These lighter units would have the responsiveness and counterfire capability of MLRS with the maneuverability of towed artillery. The one setback one must consider is resupply of launcher pods. Currently, the Heavy Expanded Mobility Tactical Truck is the only wheeled vehicle designed to transport launcher pods; this truck is large and could limit operations in a light environment.

Suggestions for Further Research

There are several areas that require further research and analysis in order to round out the full potential and capabilities of ATACMS. The future force demands a more mobile and flexible force able to react to varying degrees of global threats in a responsive and violent manner. In order to support those requirements, ATACMS would have to continue to improve its munitions types and deployability.

One system that truly fits the mold for the future force is the high mobility artillery rocket system (HIMARS). This system is wheeled and much lighter than its tracked brother, the M270A1 self-propelled loader launcher. The 6-27th Field Artillery (MLRS) fielded a HIMARS platoon as a means to test the system. This platoon deployed to Iraq and was attached to the Special Operations Forces in a remote location. This type of employment of attaching a rocket and missile platform to special operators is unprecedented and parallels the conceptual model of the future force emphasizing flexibility and adaptability. HIMARS can deploy on a C130 Hercules aircraft and can fire all MLRS and ATACMS family of munitions.

Further research on HIMARS interoperability with joint and combined forces would be a lucrative asset to fighting the nation's coalition-based wars. The HIMARS would possess the capability of early insertion, and that early pre-positioning of an ATACMS platform into an underdeveloped theater could prove critical at the operational and strategic levels.

The use of brilliant antiarmor technology munition known as ATACMS Block II BAT is also a topic one could further research. Block II is scheduled to be fielded in 2004 and has succeeded in several test fires. The further research would need to address whether US military requires a deep asset to destroy stationary or moving armored vehicles. The Army also developed the improve BAT submunition to attack target that are stationary and inactive. These "cold targets" would evade current attack assets but could still be considered a high payoff target. An underdeveloped nation with inferior technology must construct shrewd protective procedures and methods in order to survive. Certain nations would protect their SSM and SAM radar sites using the following passive measures: cover, concealment, and power down the antenna array. By powering down, a radar site would not emit a signature that sensors could easily detect. The P3I variation of the Block II ATACMS missile would give the ground commander the capability to kill these type targets if the intelligence on its general location was accurate.

Closing Statement

ATACMS clearly had revolutionary impact on deep operations doctrine and will continue to provide lethal and responsive deep fires for the joint force. When harsh weather conditions set in, and US armed forces have not yet achieved air superiority, the ATACMS missile is the munition of choice for attacking enemy high payoff targets in

support of the ground and air component commanders' operational objectives. After unprecedented results during both gulf wars, ATACMS has found its place as the critical deep attack system to support US and coalition armed forces today and in future wars.

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